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(12) **United States Patent**
Hatano

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(45) **Date of Patent: Jun. 30, 2015**

(54) **IMAGE FORMING APPARATUS AND CONTROL METHOD FOR ENABLING PROPER EXECUTION OF SETTING AND POWER-OFF OF THE IMAGE FORMING APPARATUS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 24 days.

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(22) Filed: **Feb. 7, 2013**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Feb. 16, 2012 (JP) 2012-031392

(51) **Int. Cl.**

G06F 3/12	(2006.01)
G06K 15/02	(2006.01)
G06K 15/00	(2006.01)
H04L 12/24	(2006.01)

(52) **U.S. Cl.**

CPC ***G06K 15/02*** (2013.01); ***G06K 15/4055*** (2013.01); ***G06F 3/1203*** (2013.01); ***G06F 3/1229*** (2013.01); ***G06F 3/1285*** (2013.01); ***H04L 41/0833*** (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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Primary Examiner — Nicholas Pachol

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(57) **ABSTRACT**

An image forming apparatus includes a first designation unit configured to designate a power-off task of shutting down the image forming apparatus in a designated period, a second designation unit configured to designate a setting task of executing a setting process for setting a setting item of the image forming apparatus in a designated period and a restart process for restarting the image forming apparatus after the setting process, and a task control unit configured to control execution of the designated power-off task and the designated setting task. The task control unit is configured to, if the power-off task is designated, perform control to change processing of the power-off task and the setting task according to which of the processes of the setting task a period that an end of the designated period of the power-off task reaches corresponds to.

13 Claims, 36 Drawing Sheets

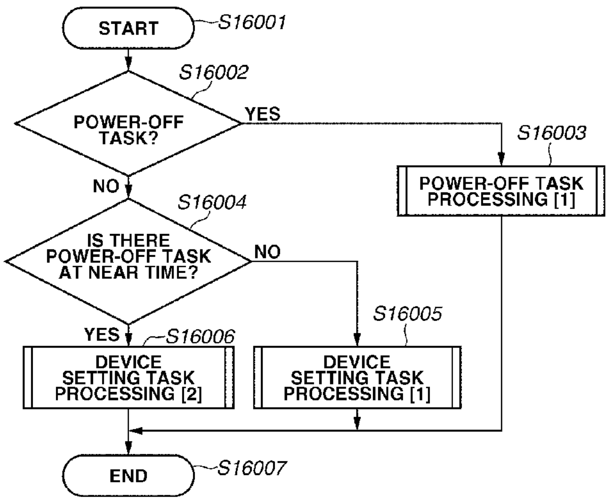

START
S16001
S16002
POWER-OFF TASK?
YES
S16003
POWER-OFF TASK PROCESSING [1]
NO
S16004
IS THERE POWER-OFF TASK AT NEAR TIME?
NO
S16005
YES
S16006
DEVICE SETTING TASK PROCESSING [2]
DEVICE SETTING TASK PROCESSING [1]
END
S16007

FIG.1

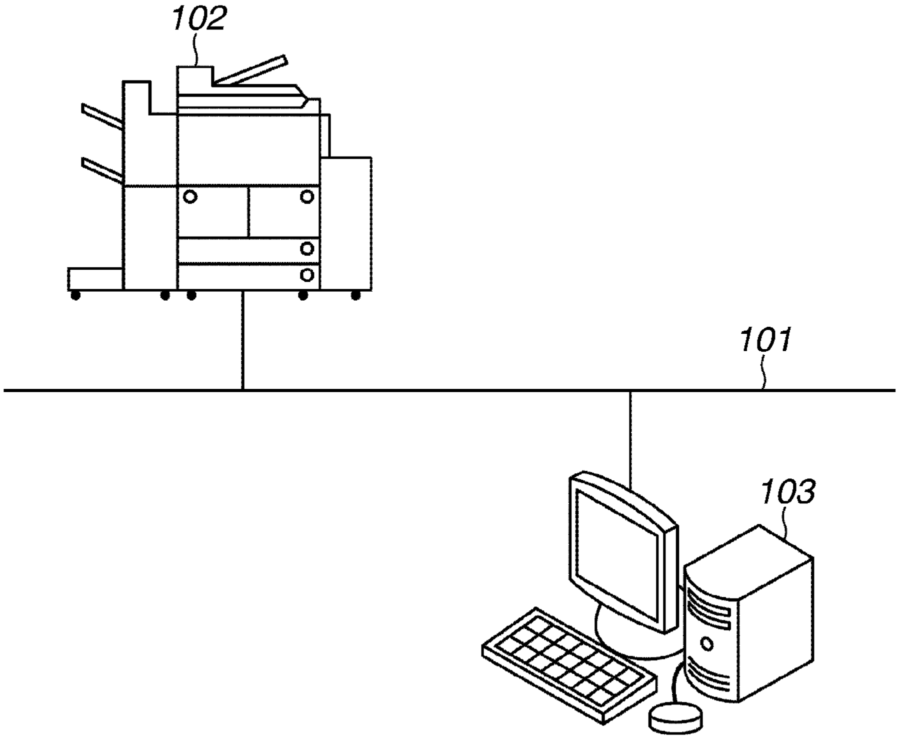


FIG.2

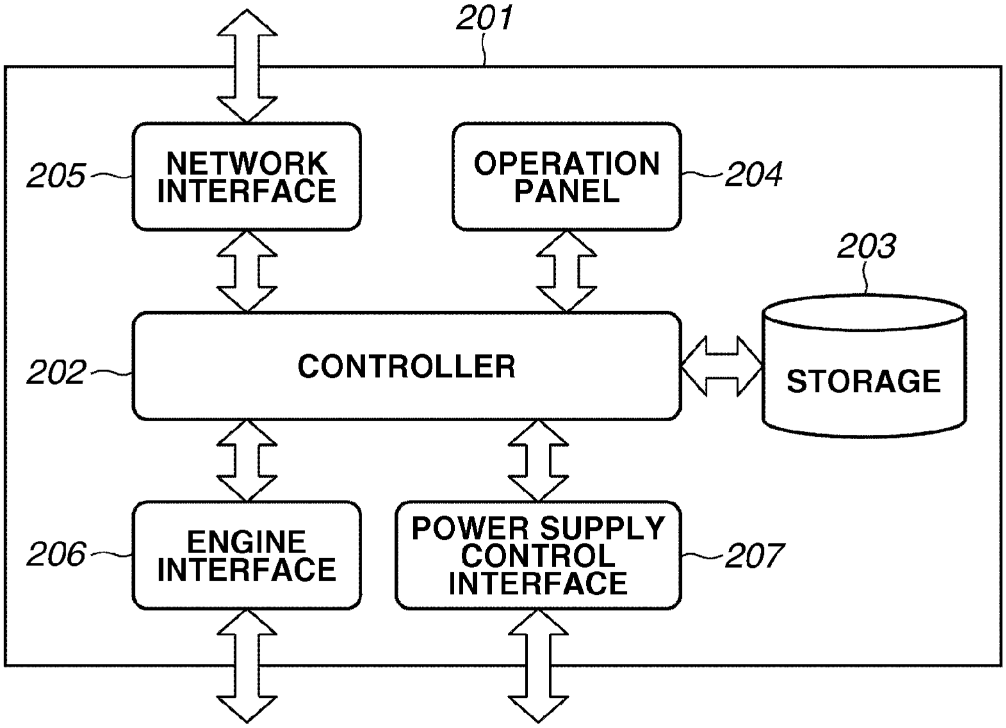

201
205
NETWORK INTERFACE
OPERATION PANEL
204
203
202
CONTROLLER
STORAGE
206
ENGINE INTERFACE
POWER SUPPLY CONTROL INTERFACE
207

FIG.3

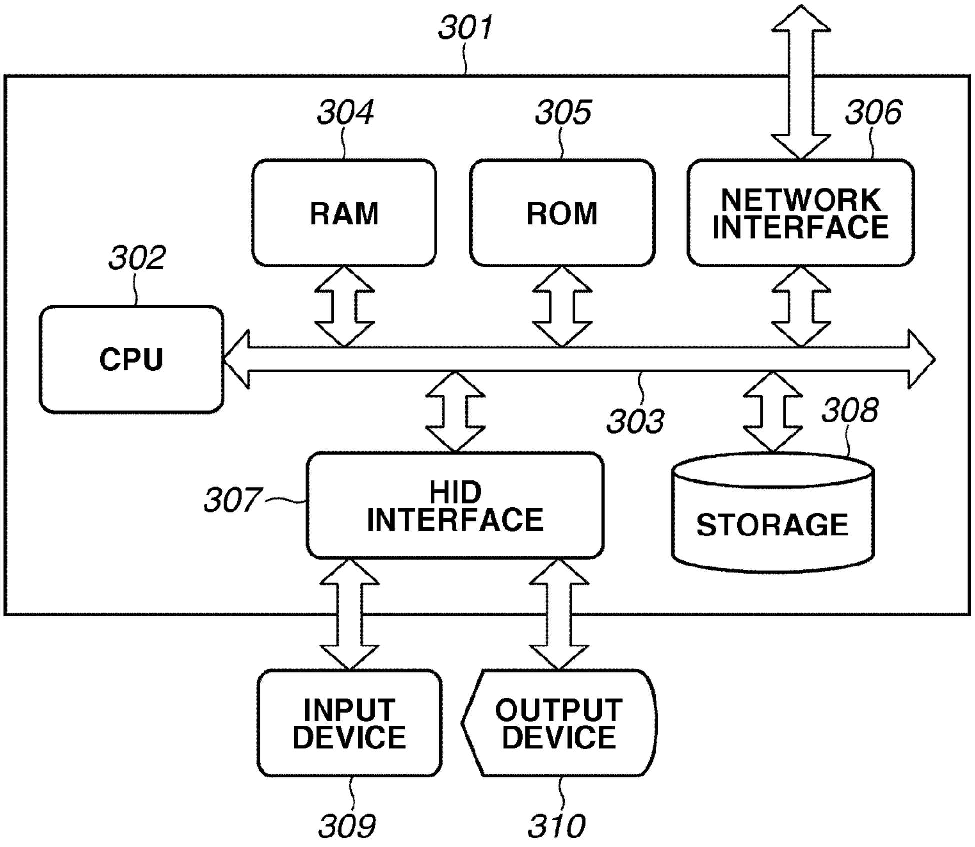

301
304
RAM
305
ROM
306
NETWORK INTERFACE
302
CPU
303
308
307
HID INTERFACE
STORAGE
INPUT DEVICE
OUTPUT DEVICE
309
310

FIG.4

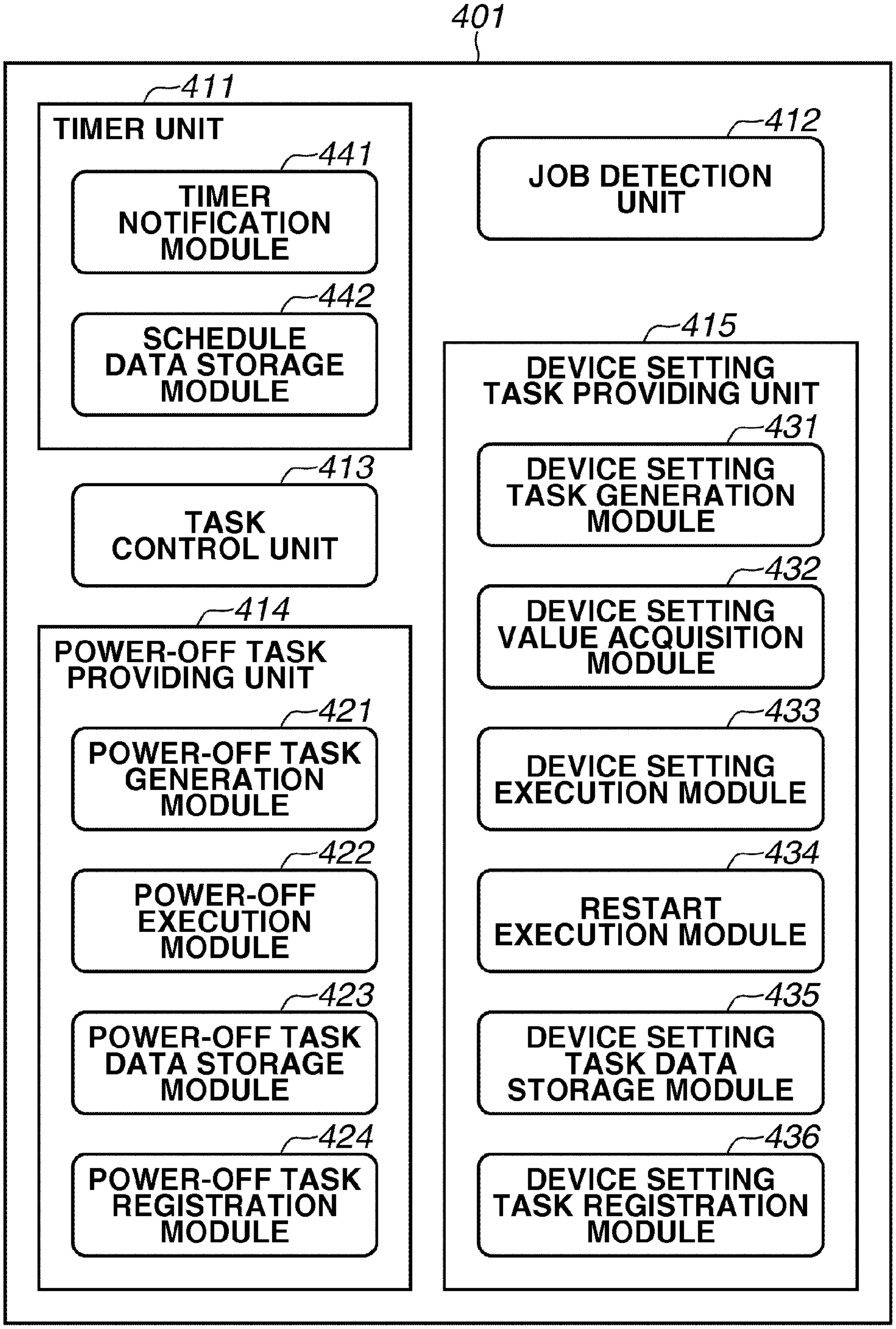

401
411
TIMER UNIT
441
TIMER NOTIFICATION MODULE
442
SCHEDULE DATA STORAGE MODULE
412
JOB DETECTION UNIT
415
DEVICE SETTING TASK PROVIDING UNIT
431
DEVICE SETTING TASK GENERATION MODULE
413
TASK CONTROL UNIT
432
DEVICE SETTING VALUE ACQUISITION MODULE
414
POWER-OFF TASK PROVIDING UNIT
421
POWER-OFF TASK GENERATION MODULE
433
DEVICE SETTING EXECUTION MODULE
422
POWER-OFF EXECUTION MODULE
434
RESTART EXECUTION MODULE
423
POWER-OFF TASK DATA STORAGE MODULE
435
DEVICE SETTING TASK DATA STORAGE MODULE
424
POWER-OFF TASK REGISTRATION MODULE
436
DEVICE SETTING TASK REGISTRATION MODULE

FIG.5

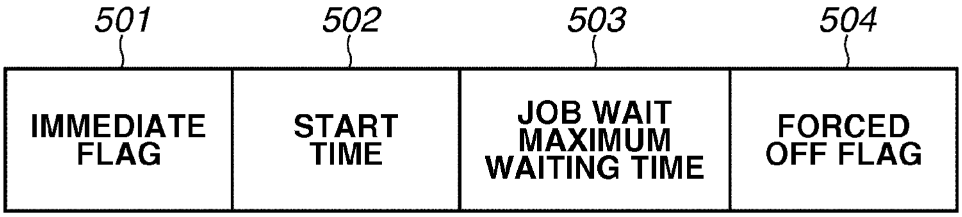

501
502
503
504
IMMEDIATE FLAG
START TIME
JOB WAIT MAXIMUM WAITING TIME
FORCED OFF FLAG

FIG.6

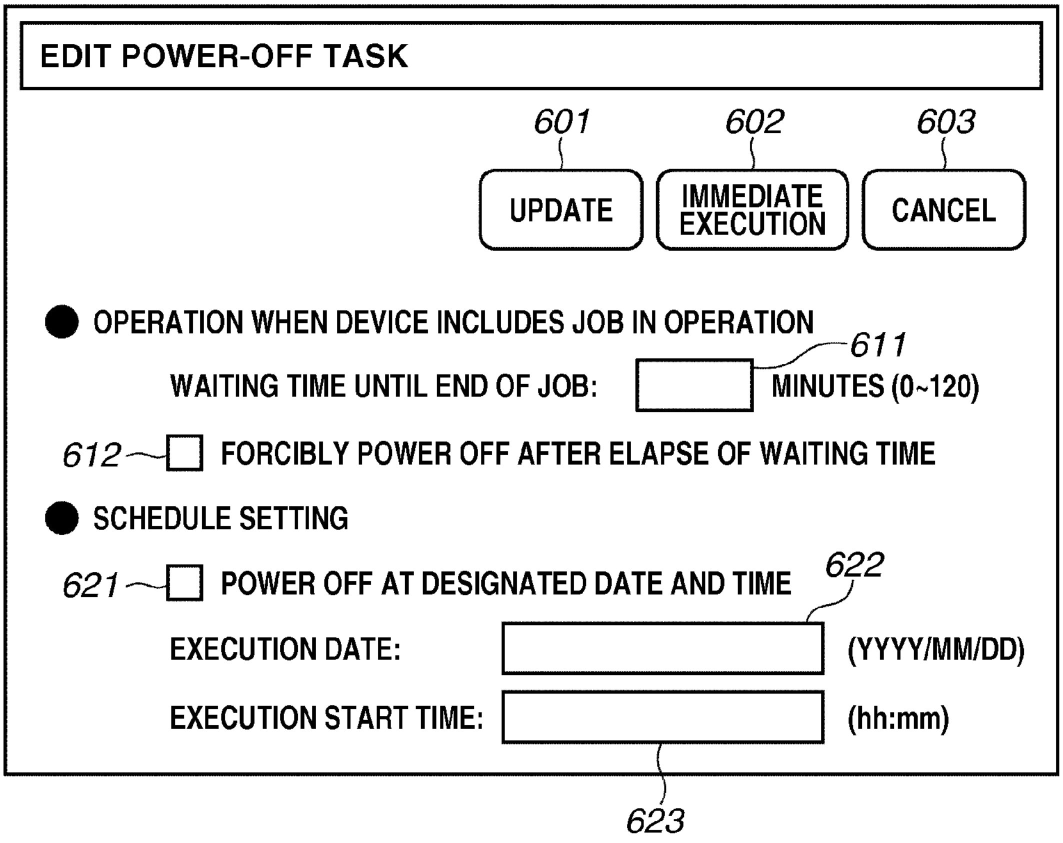

EDIT POWER-OFF TASK
601
602
603
UPDATE
IMMEDIATE EXECUTION
CANCEL
● OPERATION WHEN DEVICE INCLUDES JOB IN OPERATION
611
WAITING TIME UNTIL END OF JOB:
MINUTES (0~120)
612
□ FORCIBLY POWER OFF AFTER ELAPSE OF WAITING TIME
● SCHEDULE SETTING
621
□ POWER OFF AT DESIGNATED DATE AND TIME
622
EXECUTION DATE:
(YYYY/MM/DD)
EXECUTION START TIME:
(hh:mm)
623

FIG.7

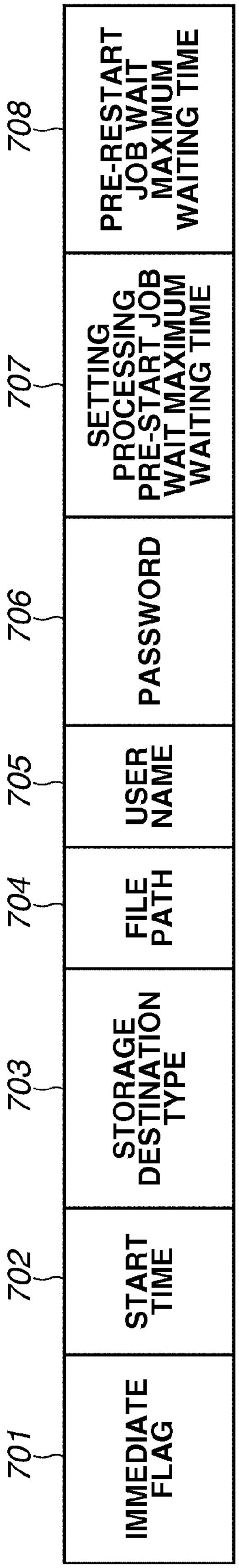
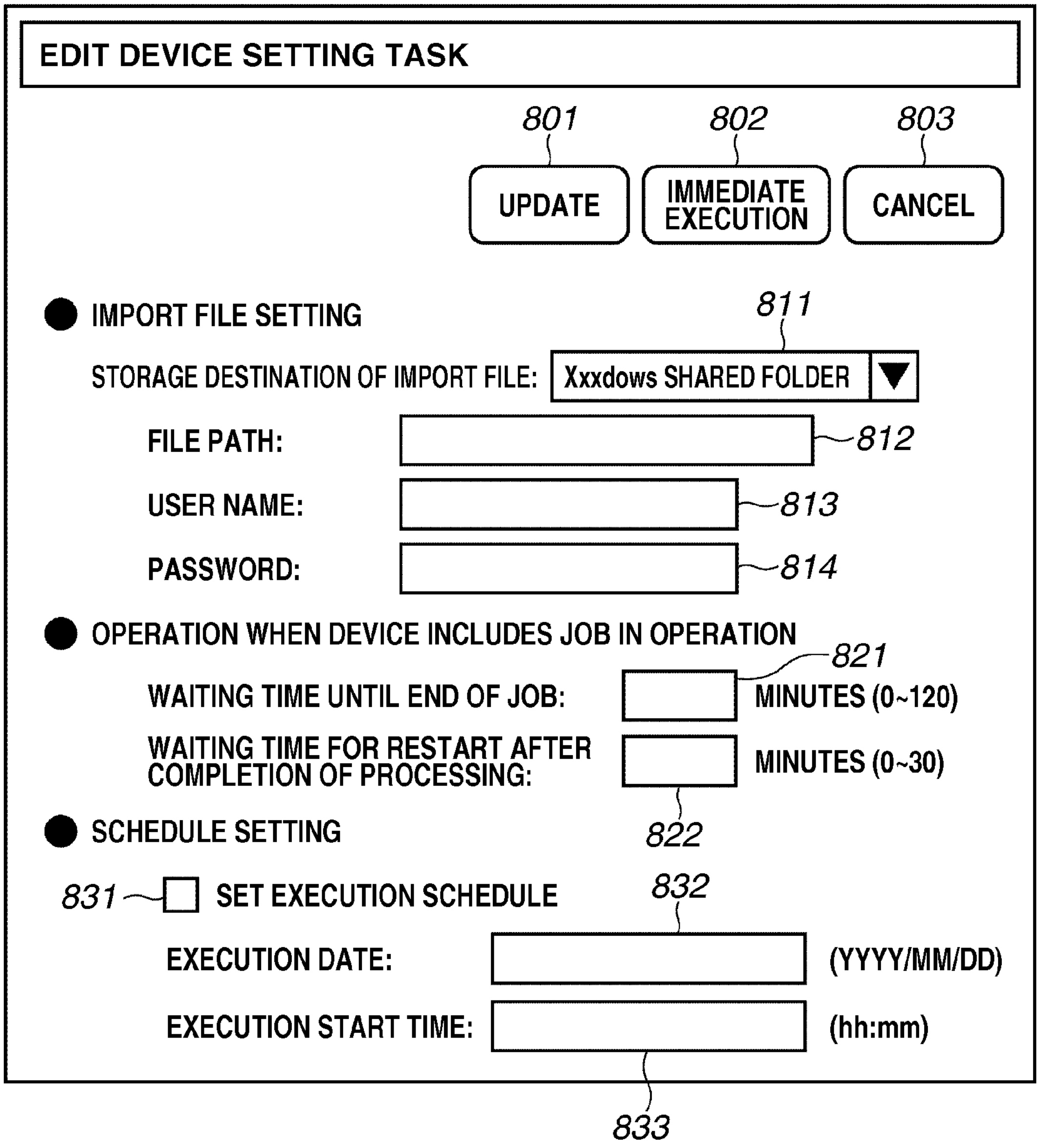

701
IMMEDIATE FLAG
702
START TIME
703
STORAGE DESTINATION TYPE
704
FILE PATH
705
USER NAME
706
PASSWORD
707
SETTING PROCESSING PRE-START JOB WAIT MAXIMUM WAITING TIME
708
PRE-RESTART JOB WAIT MAXIMUM WAITING TIME

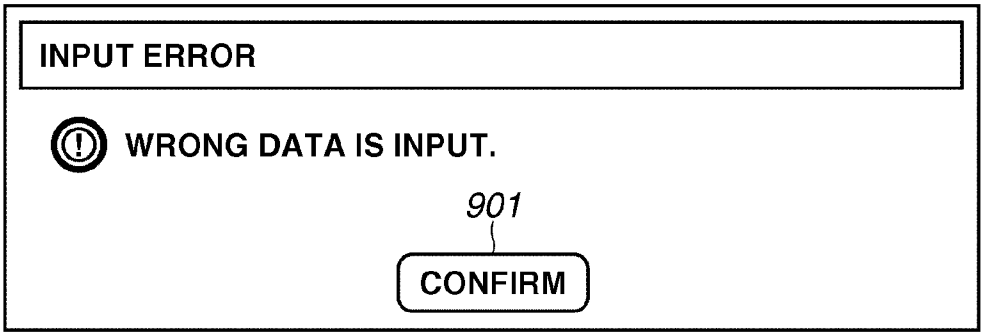
FIG.8



EDIT DEVICE SETTING TASK

- ● IMPORT FILE SETTING
  - STORAGE DESTINATION OF IMPORT FILE: Xxxdows SHARED FOLDER ▼
  - FILE PATH:
  - USER NAME:
  - PASSWORD:
- ● OPERATION WHEN DEVICE INCLUDES JOB IN OPERATION
  - WAITING TIME UNTIL END OF JOB: MINUTES (0~120)
  - WAITING TIME FOR RESTART AFTER COMPLETION OF PROCESSING: MINUTES (0~30)
- ● SCHEDULE SETTING
  - □ SET EXECUTION SCHEDULE
  - EXECUTION DATE: (YYYY/MM/DD)
  - EXECUTION START TIME: (hh:mm)

FIG.9



INPUT ERROR

WRONG DATA IS INPUT.

FIG.10

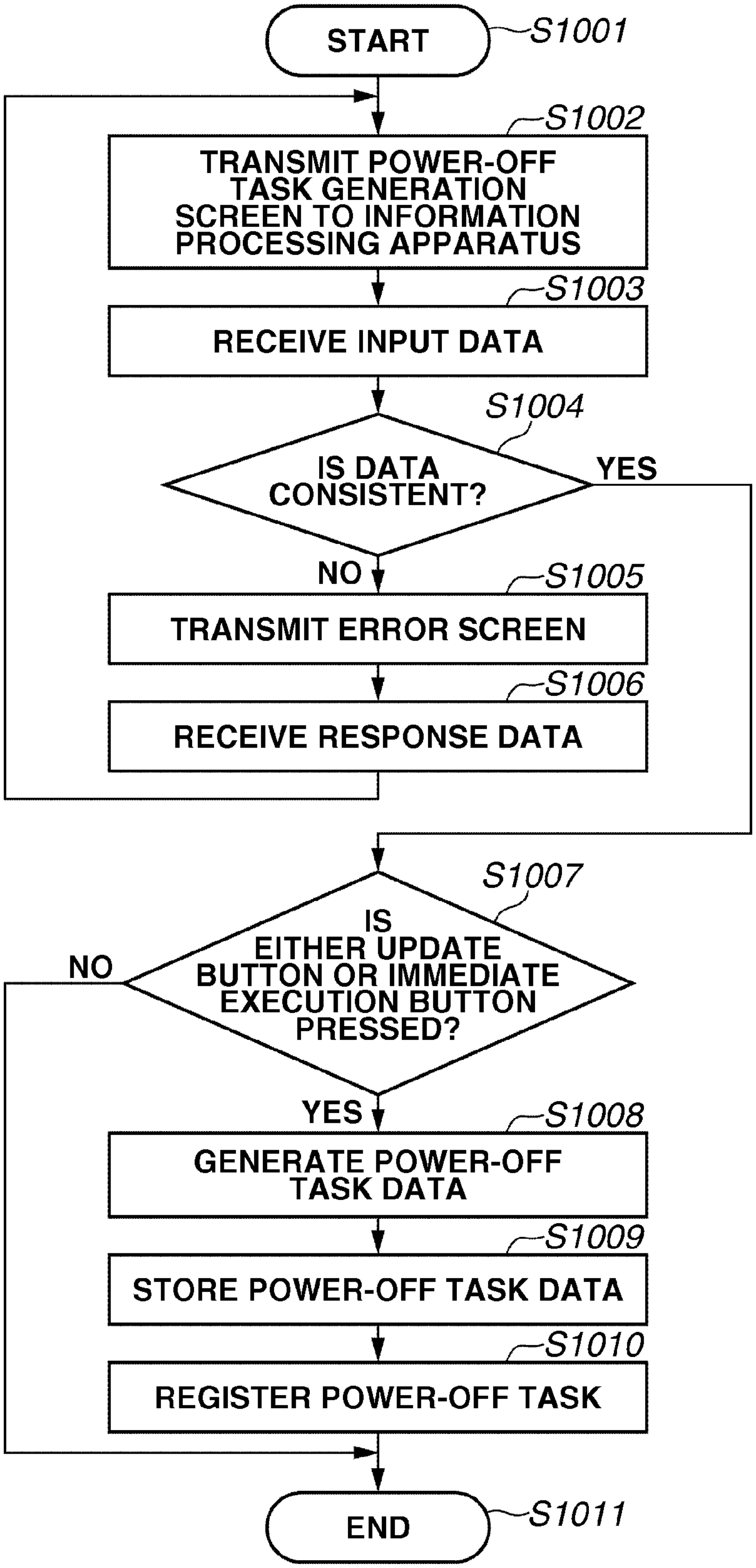

START
S1001
S1002
TRANSMIT POWER-OFF TASK GENERATION SCREEN TO INFORMATION PROCESSING APPARATUS
S1003
RECEIVE INPUT DATA
S1004
IS DATA CONSISTENT?
YES
NO
S1005
TRANSMIT ERROR SCREEN
S1006
RECEIVE RESPONSE DATA
S1007
IS EITHER UPDATE BUTTON OR IMMEDIATE EXECUTION BUTTON PRESSED?
NO
YES
S1008
GENERATE POWER-OFF TASK DATA
S1009
STORE POWER-OFF TASK DATA
S1010
REGISTER POWER-OFF TASK
END
S1011

FIG.11

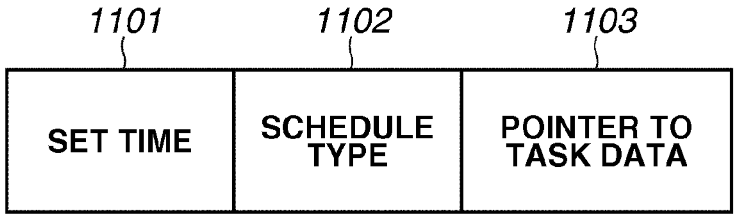


FIG.12

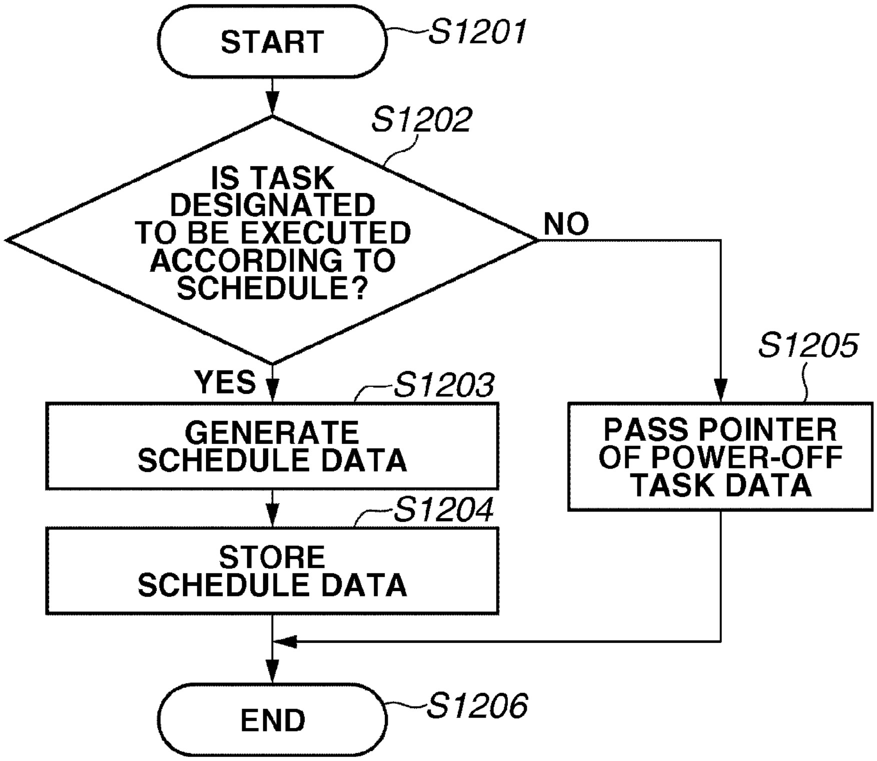

START
S1201
S1202
IS TASK DESIGNATED TO BE EXECUTED ACCORDING TO SCHEDULE?
NO
YES
S1203
GENERATE SCHEDULE DATA
S1204
STORE SCHEDULE DATA
S1205
PASS POINTER OF POWER-OFF TASK DATA
END
S1206

FIG.13

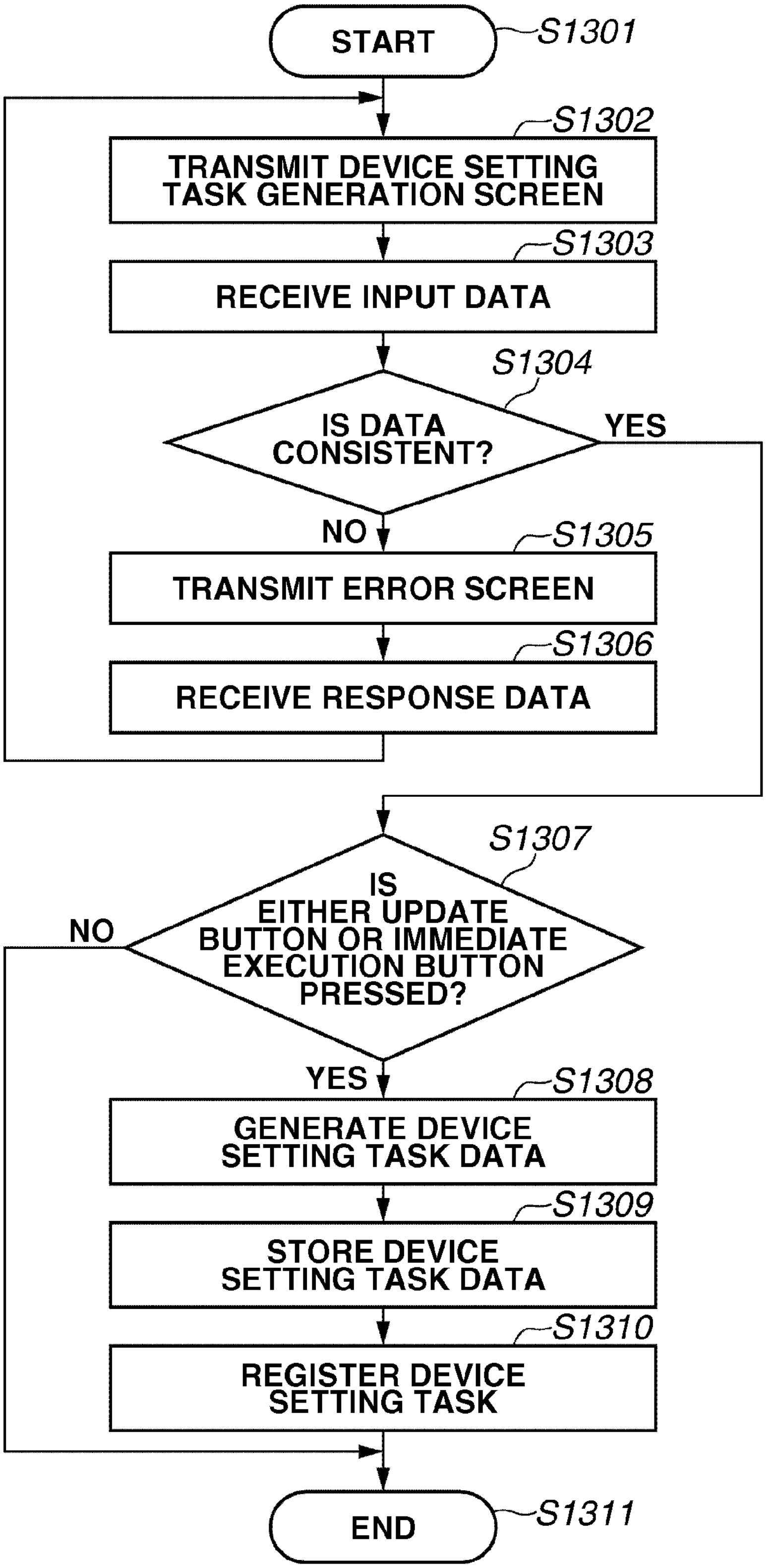

START
S1301
S1302
TRANSMIT DEVICE SETTING TASK GENERATION SCREEN
S1303
RECEIVE INPUT DATA
S1304
IS DATA CONSISTENT?
YES
NO
S1305
TRANSMIT ERROR SCREEN
S1306
RECEIVE RESPONSE DATA
S1307
IS EITHER UPDATE BUTTON OR IMMEDIATE EXECUTION BUTTON PRESSED?
NO
YES
S1308
GENERATE DEVICE SETTING TASK DATA
S1309
STORE DEVICE SETTING TASK DATA
S1310
REGISTER DEVICE SETTING TASK
END
S1311

FIG.14

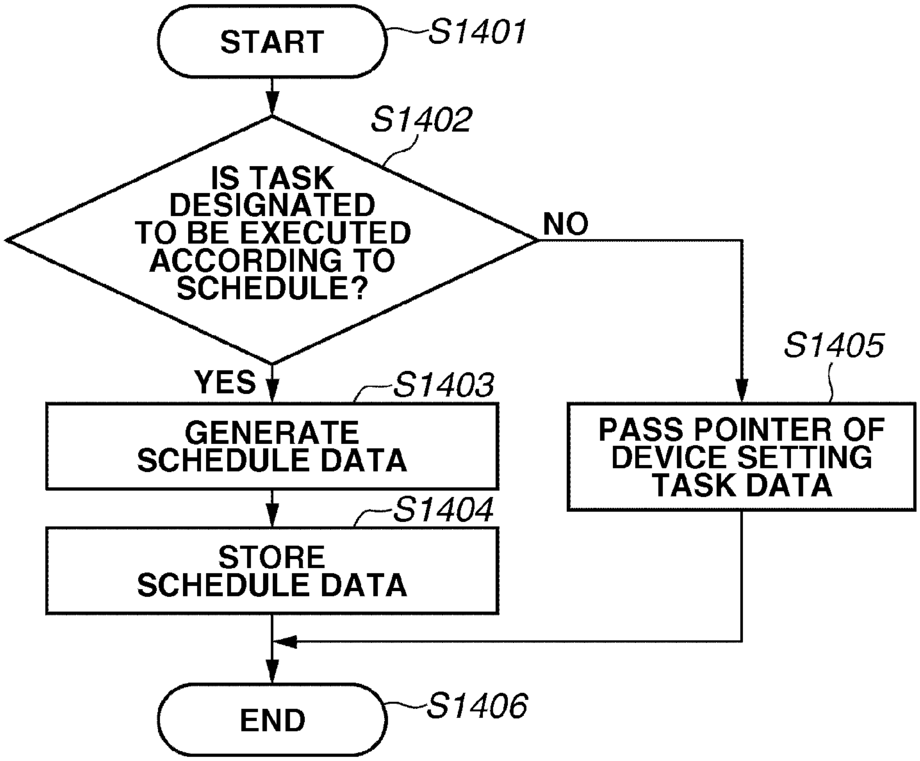

START
S1401
S1402
IS TASK DESIGNATED TO BE EXECUTED ACCORDING TO SCHEDULE?
NO
YES
S1403
GENERATE SCHEDULE DATA
S1404
STORE SCHEDULE DATA
S1405
PASS POINTER OF DEVICE SETTING TASK DATA
END
S1406

FIG.15

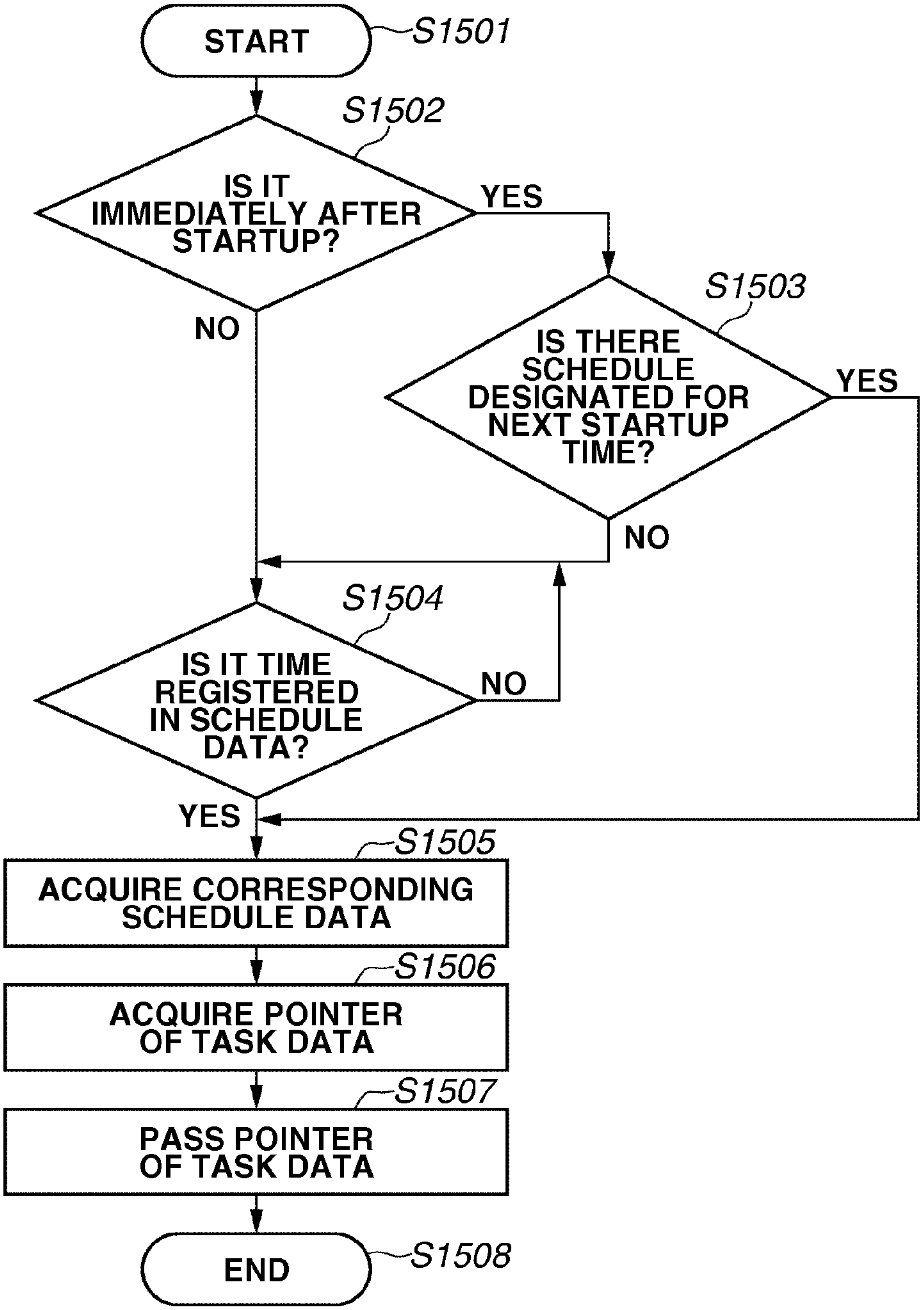

START
S1501
S1502
IS IT IMMEDIATELY AFTER STARTUP?
YES
NO
S1503
IS THERE SCHEDULE DESIGNATED FOR NEXT STARTUP TIME?
YES
NO
S1504
IS IT TIME REGISTERED IN SCHEDULE DATA?
NO
YES
S1505
ACQUIRE CORRESPONDING SCHEDULE DATA
S1506
ACQUIRE POINTER OF TASK DATA
S1507
PASS POINTER OF TASK DATA
END
S1508

FIG.16A

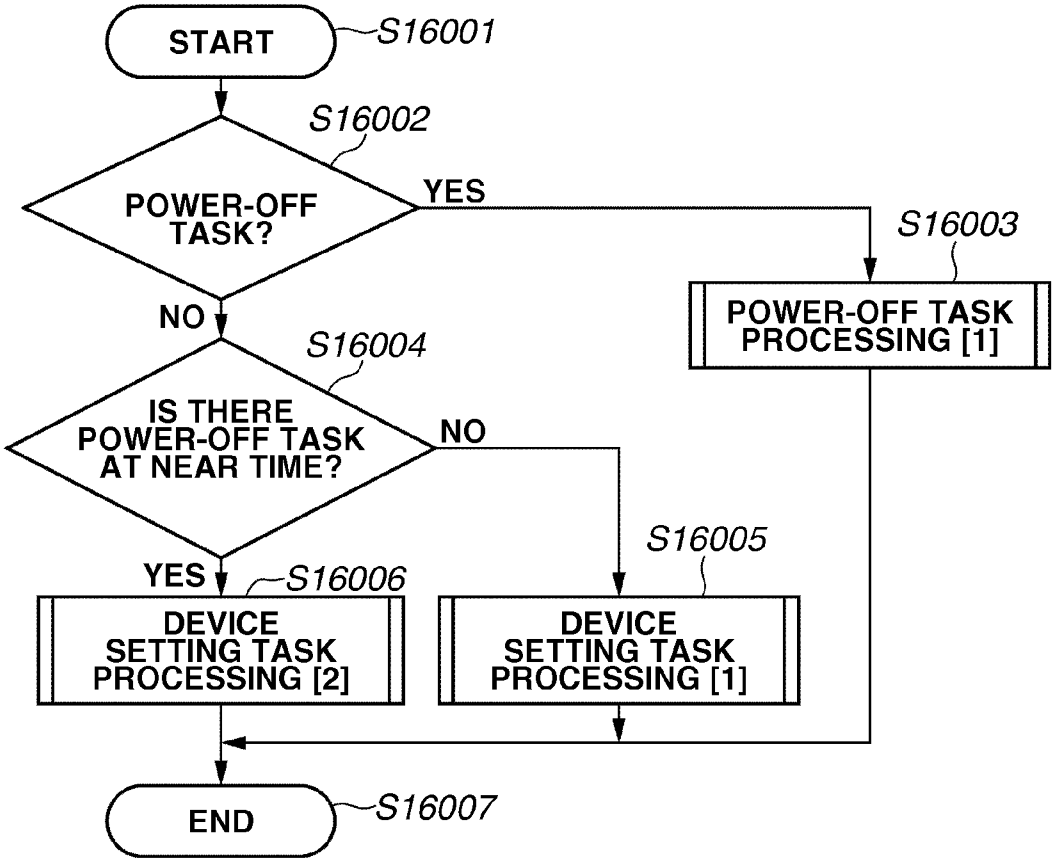

START
S16001
S16002
POWER-OFF TASK?
YES
S16003
POWER-OFF TASK PROCESSING [1]
NO
S16004
IS THERE POWER-OFF TASK AT NEAR TIME?
NO
S16005
YES
S16006
DEVICE SETTING TASK PROCESSING [2]
DEVICE SETTING TASK PROCESSING [1]
END
S16007

FIG.16B

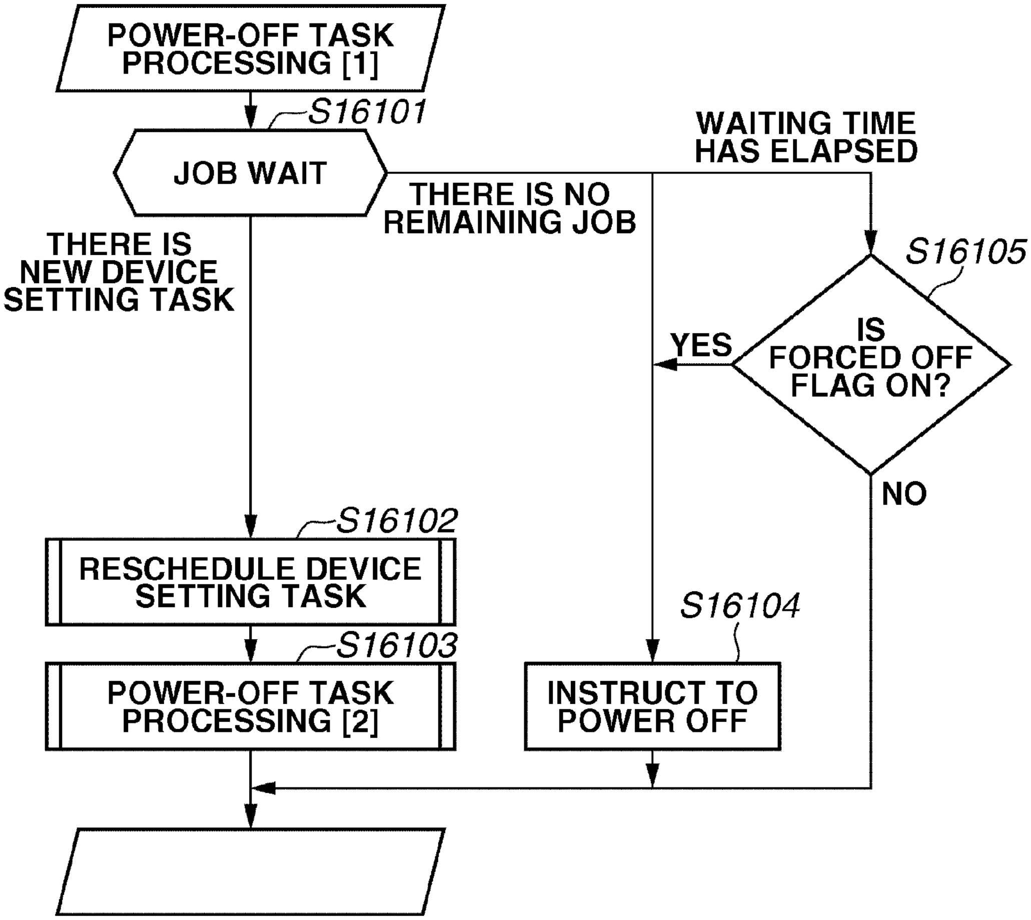

POWER-OFF TASK PROCESSING [1]
S16101
JOB WAIT
WAITING TIME HAS ELAPSED
THERE IS NO REMAINING JOB
THERE IS NEW DEVICE SETTING TASK
S16105
IS FORCED OFF FLAG ON?
YES
NO
S16102
RESCHEDULE DEVICE SETTING TASK
S16103
POWER-OFF TASK PROCESSING [2]
S16104
INSTRUCT TO POWER OFF

FIG.16C

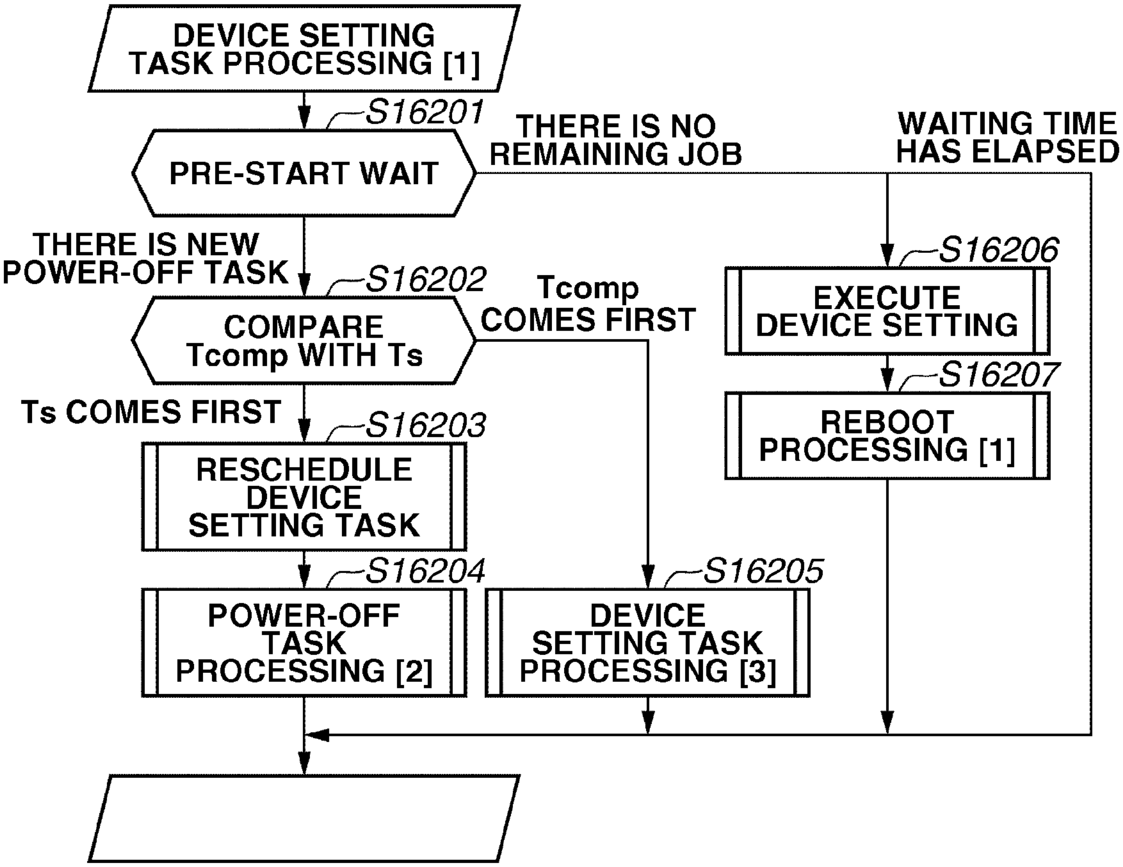

DEVICE SETTING TASK PROCESSING [1]
S16201
PRE-START WAIT
THERE IS NO REMAINING JOB
WAITING TIME HAS ELAPSED
THERE IS NEW POWER-OFF TASK
S16202
COMPARE Tcomp WITH Ts
Tcomp COMES FIRST
S16206
EXECUTE DEVICE SETTING
S16207
REBOOT PROCESSING [1]
Ts COMES FIRST
S16203
RESCHEDULE DEVICE SETTING TASK
S16204
POWER-OFF TASK PROCESSING [2]
S16205
DEVICE SETTING TASK PROCESSING [3]

FIG.16D

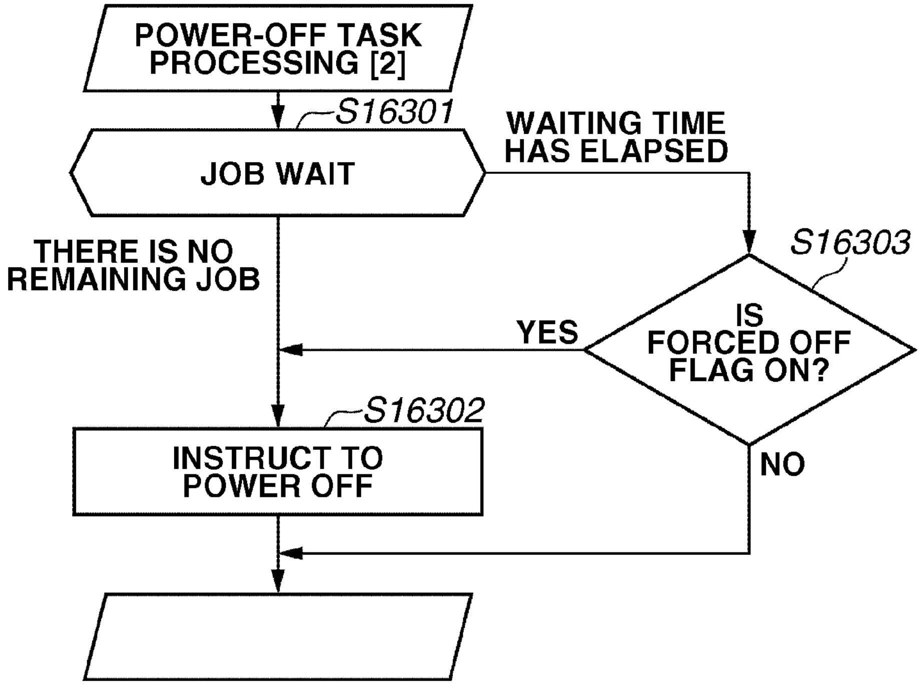

POWER-OFF TASK PROCESSING [2]
S16301
JOB WAIT
WAITING TIME HAS ELAPSED
THERE IS NO REMAINING JOB
S16303
IS FORCED OFF FLAG ON?
YES
NO
S16302
INSTRUCT TO POWER OFF

FIG.16E

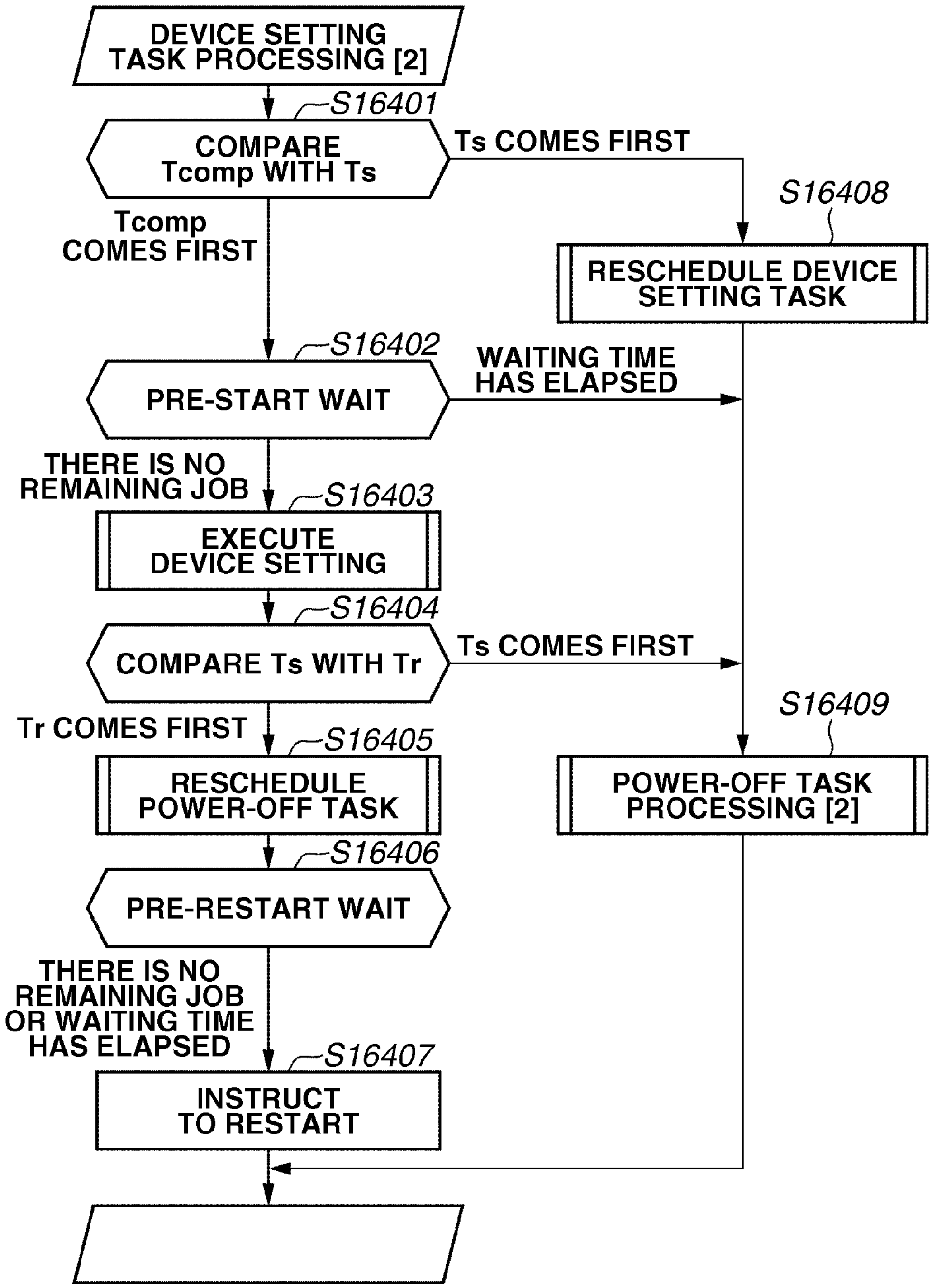

DEVICE SETTING TASK PROCESSING [2]
S16401
COMPARE Tcomp WITH Ts
Ts COMES FIRST
Tcomp COMES FIRST
S16408
RESCHEDULE DEVICE SETTING TASK
S16402
PRE-START WAIT
WAITING TIME HAS ELAPSED
THERE IS NO REMAINING JOB
S16403
EXECUTE DEVICE SETTING
S16404
COMPARE Ts WITH Tr
Ts COMES FIRST
Tr COMES FIRST
S16405
RESCHEDULE POWER-OFF TASK
S16409
POWER-OFF TASK PROCESSING [2]
S16406
PRE-RESTART WAIT
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
S16407
INSTRUCT TO RESTART

FIG.16F

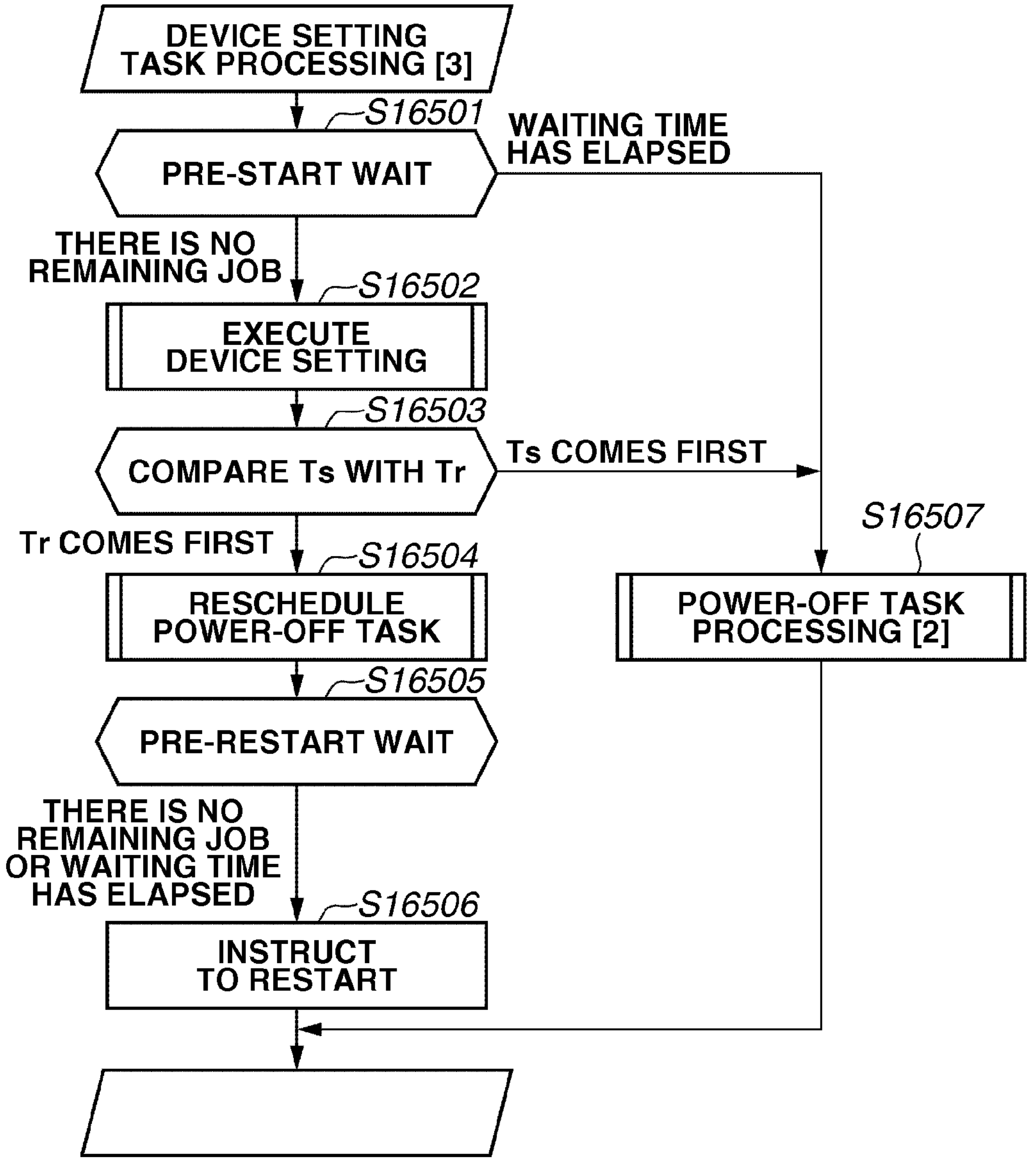

DEVICE SETTING TASK PROCESSING [3]
S16501
PRE-START WAIT
WAITING TIME HAS ELAPSED
THERE IS NO REMAINING JOB
S16502
EXECUTE DEVICE SETTING
S16503
COMPARE Ts WITH Tr
Ts COMES FIRST
Tr COMES FIRST
S16504
RESCHEDULE POWER-OFF TASK
S16507
POWER-OFF TASK PROCESSING [2]
S16505
PRE-RESTART WAIT
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
S16506
INSTRUCT TO RESTART

FIG.16G

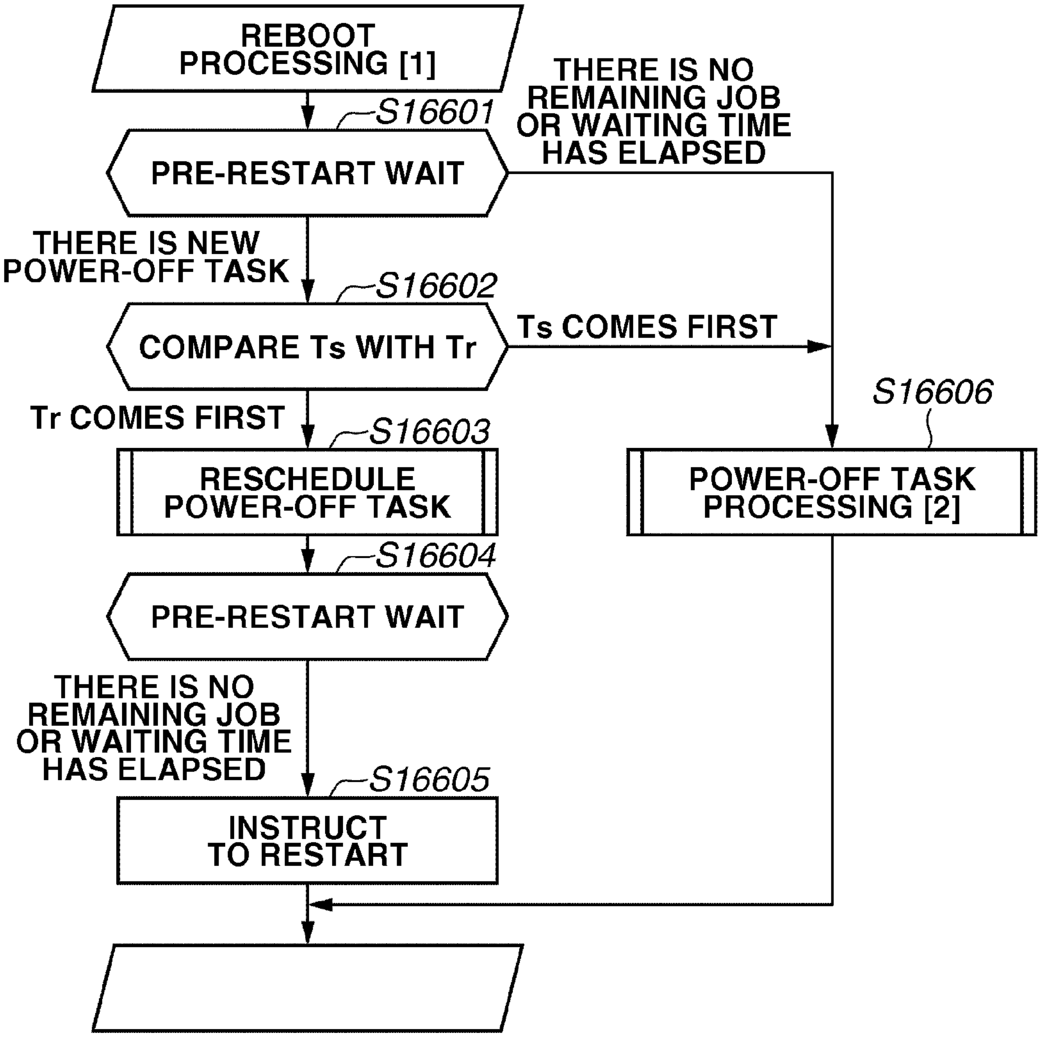
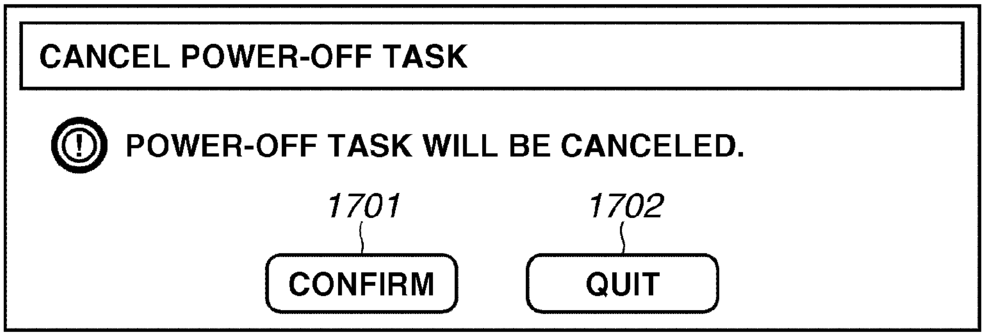

REBOOT PROCESSING [1]
S16601
PRE-RESTART WAIT
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
THERE IS NEW POWER-OFF TASK
S16602
COMPARE Ts WITH Tr
Ts COMES FIRST
Tr COMES FIRST
S16603
RESCHEDULE POWER-OFF TASK
S16606
POWER-OFF TASK PROCESSING [2]
S16604
PRE-RESTART WAIT
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
S16605
INSTRUCT TO RESTART

FIG.17



CANCEL POWER-OFF TASK

POWER-OFF TASK WILL BE CANCELED.

FIG.18

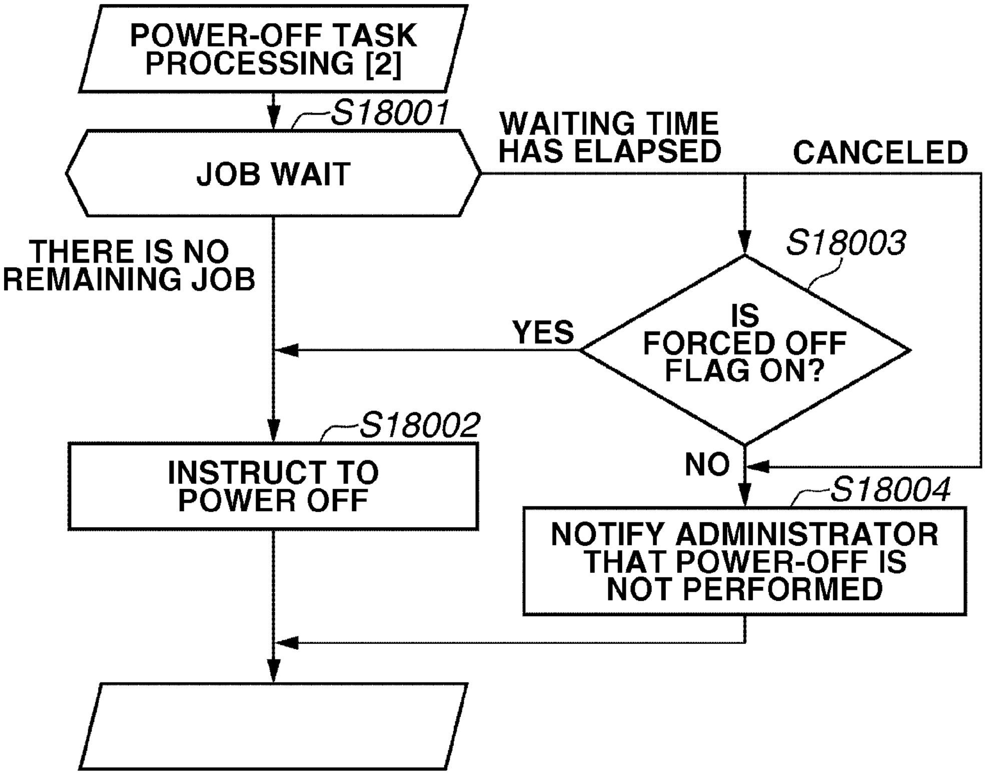

POWER-OFF TASK PROCESSING [2]
S18001
JOB WAIT
WAITING TIME HAS ELAPSED
CANCELED
THERE IS NO REMAINING JOB
S18003
IS FORCED OFF FLAG ON?
YES
NO
S18002
INSTRUCT TO POWER OFF
S18004
NOTIFY ADMINISTRATOR THAT POWER-OFF IS NOT PERFORMED

FIG.19

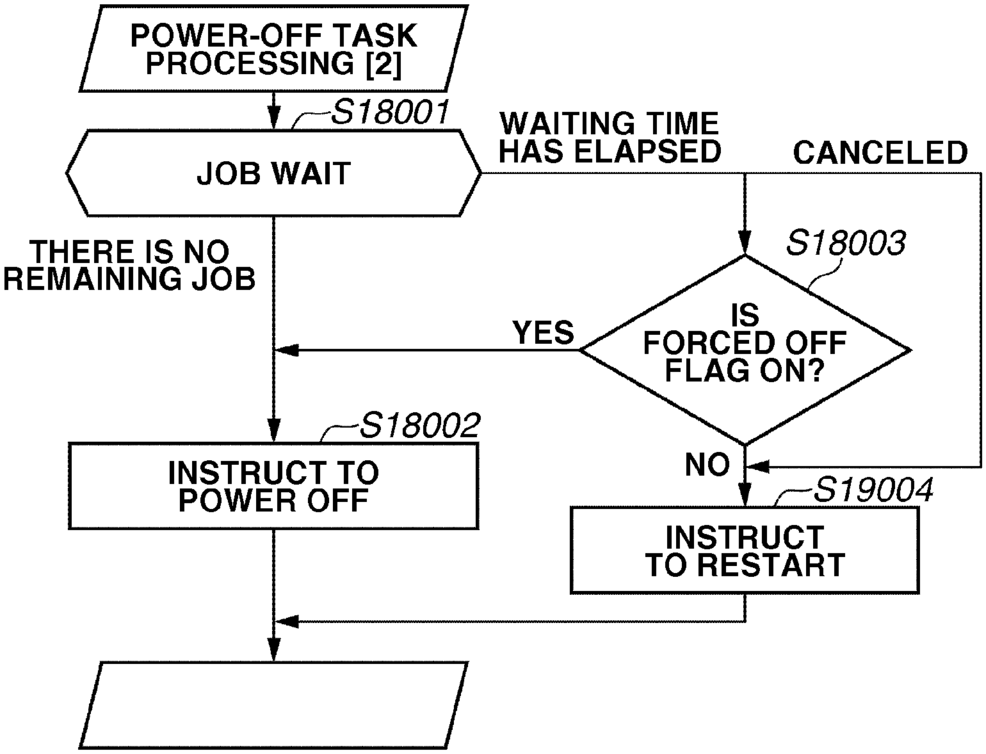

POWER-OFF TASK PROCESSING [2]
S18001
JOB WAIT
WAITING TIME HAS ELAPSED
CANCELED
THERE IS NO REMAINING JOB
S18003
IS FORCED OFF FLAG ON?
YES
NO
S18002
INSTRUCT TO POWER OFF
S19004
INSTRUCT TO RESTART

FIG.20

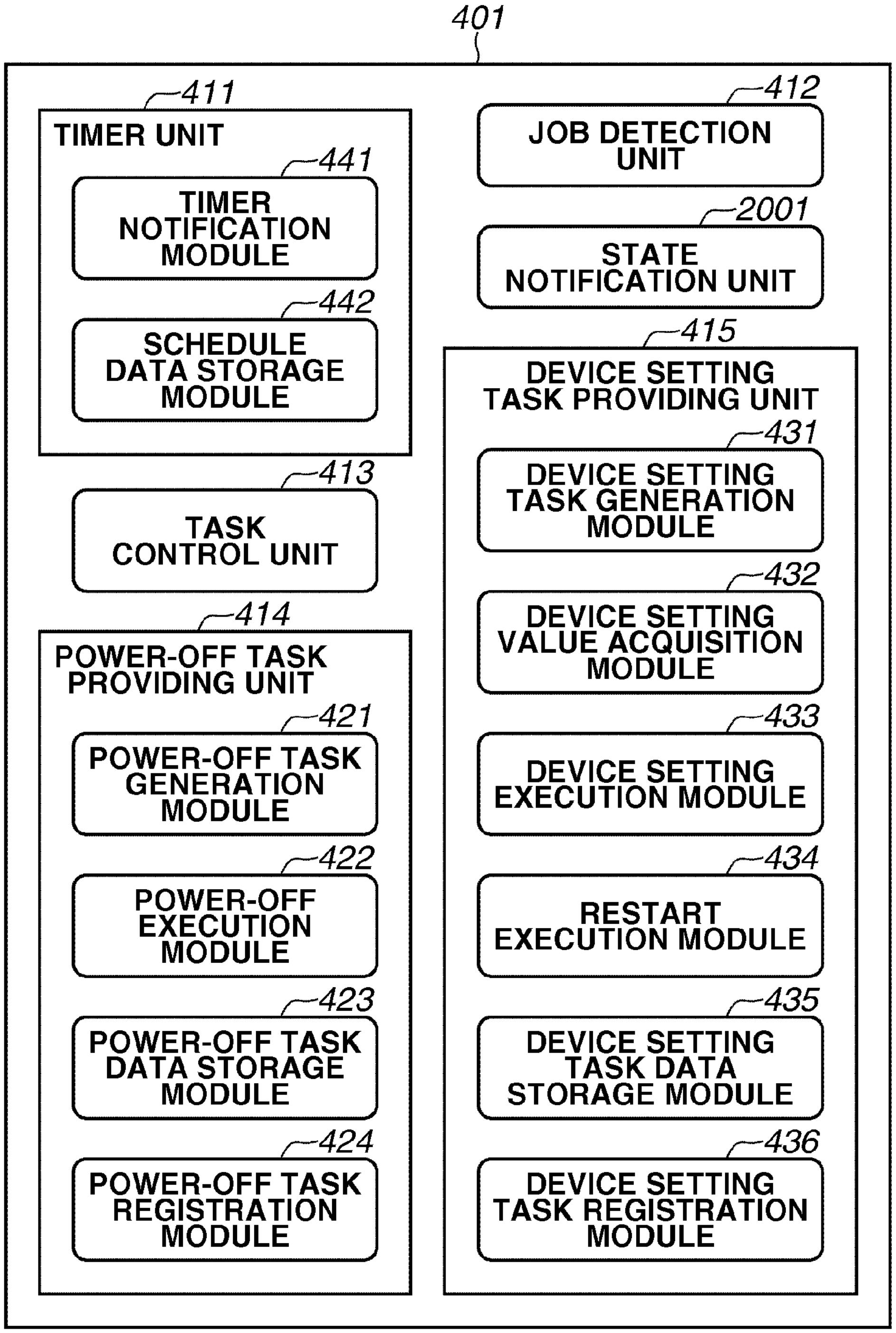

401
411
TIMER UNIT
441
TIMER NOTIFICATION MODULE
442
SCHEDULE DATA STORAGE MODULE
413
TASK CONTROL UNIT
414
POWER-OFF TASK PROVIDING UNIT
421
POWER-OFF TASK GENERATION MODULE
422
POWER-OFF EXECUTION MODULE
423
POWER-OFF TASK DATA STORAGE MODULE
424
POWER-OFF TASK REGISTRATION MODULE
412
JOB DETECTION UNIT
2001
STATE NOTIFICATION UNIT
415
DEVICE SETTING TASK PROVIDING UNIT
431
DEVICE SETTING TASK GENERATION MODULE
432
DEVICE SETTING VALUE ACQUISITION MODULE
433
DEVICE SETTING EXECUTION MODULE
434
RESTART EXECUTION MODULE
435
DEVICE SETTING TASK DATA STORAGE MODULE
436
DEVICE SETTING TASK REGISTRATION MODULE

FIG.21A

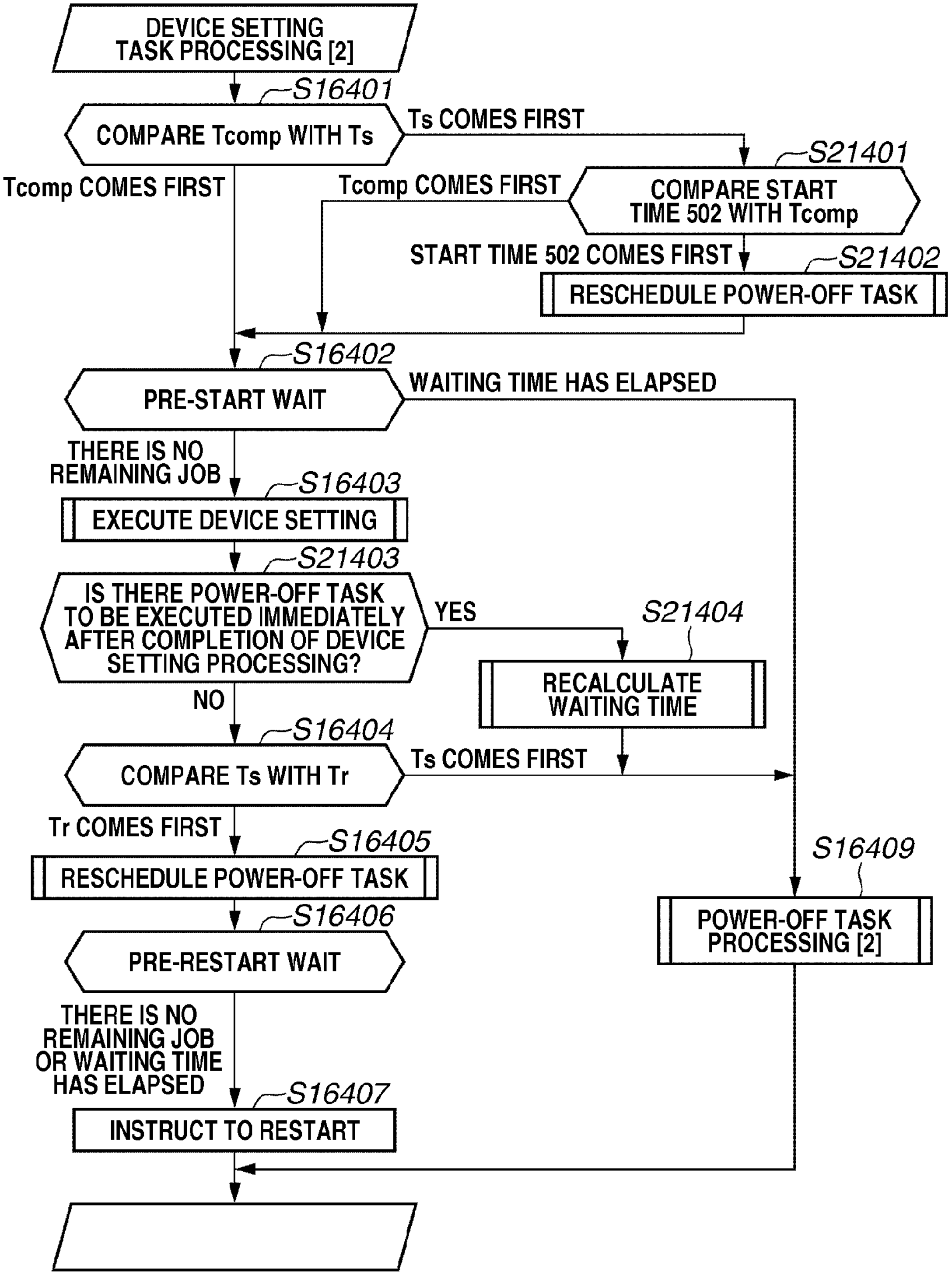

DEVICE SETTING TASK PROCESSING [2]
S16401
COMPARE Tcomp WITH Ts
Ts COMES FIRST
Tcomp COMES FIRST
S21401
COMPARE START TIME 502 WITH Tcomp
Tcomp COMES FIRST
START TIME 502 COMES FIRST
S21402
RESCHEDULE POWER-OFF TASK
S16402
PRE-START WAIT
WAITING TIME HAS ELAPSED
THERE IS NO REMAINING JOB
S16403
EXECUTE DEVICE SETTING
S21403
IS THERE POWER-OFF TASK TO BE EXECUTED IMMEDIATELY AFTER COMPLETION OF DEVICE SETTING PROCESSING?
YES
S21404
RECALCULATE WAITING TIME
NO
S16404
COMPARE Ts WITH Tr
Ts COMES FIRST
Tr COMES FIRST
S16405
RESCHEDULE POWER-OFF TASK
S16409
POWER-OFF TASK PROCESSING [2]
S16406
PRE-RESTART WAIT
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
S16407
INSTRUCT TO RESTART

FIG.21B

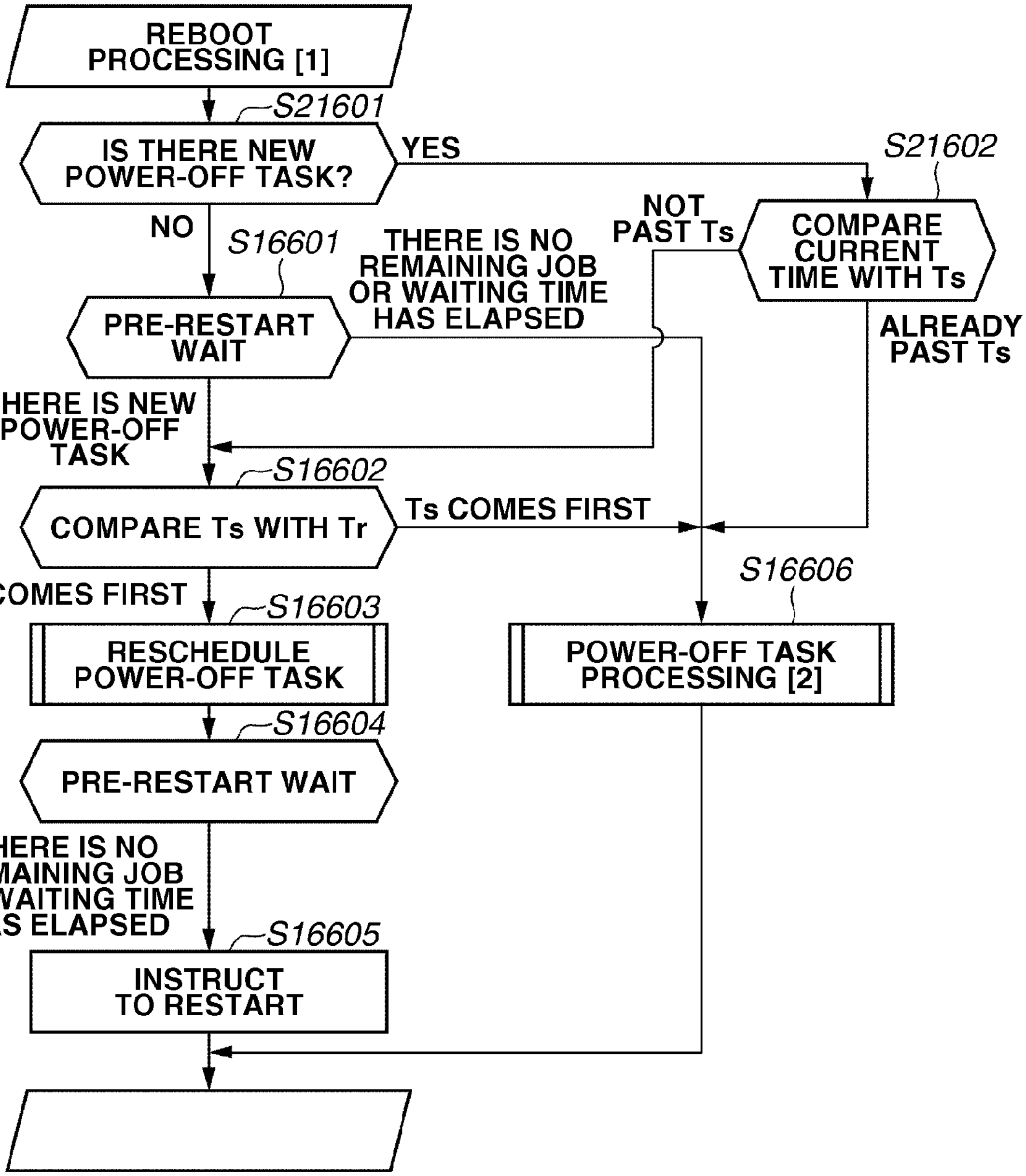

REBOOT PROCESSING [1]
S21601
IS THERE NEW POWER-OFF TASK?
YES
S21602
NO
S16601
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
NOT PAST Ts
COMPARE CURRENT TIME WITH Ts
PRE-RESTART WAIT
ALREADY PAST Ts
THERE IS NEW POWER-OFF TASK
S16602
COMPARE Ts WITH Tr
Ts COMES FIRST
S16606
Tr COMES FIRST
S16603
RESCHEDULE POWER-OFF TASK
POWER-OFF TASK PROCESSING [2]
S16604
PRE-RESTART WAIT
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
S16605
INSTRUCT TO RESTART

FIG.22

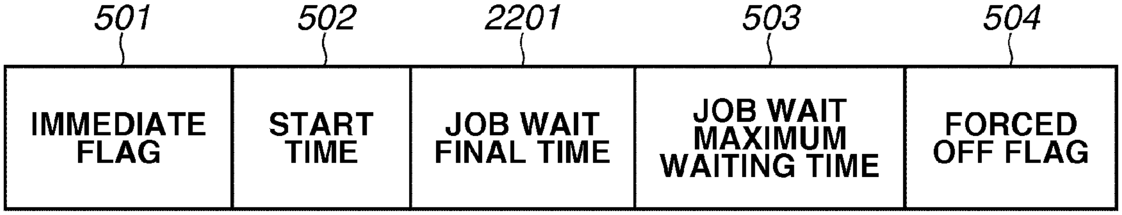
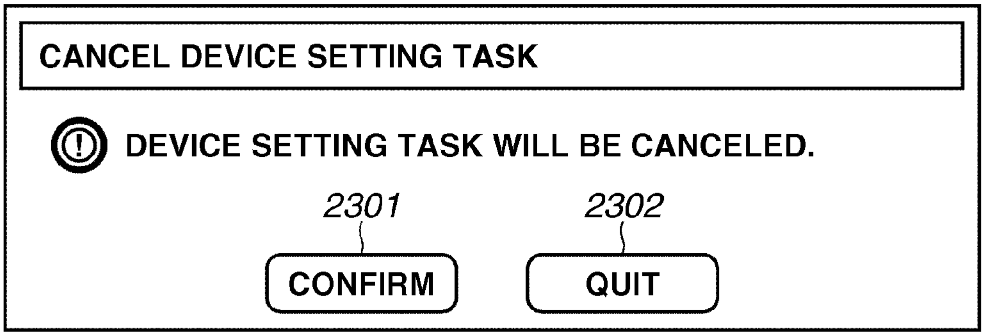

501
502
2201
503
504
IMMEDIATE FLAG
START TIME
JOB WAIT FINAL TIME
JOB WAIT MAXIMUM WAITING TIME
FORCED OFF FLAG

FIG.23



CANCEL DEVICE SETTING TASK

DEVICE SETTING TASK WILL BE CANCELED.

FIG.24

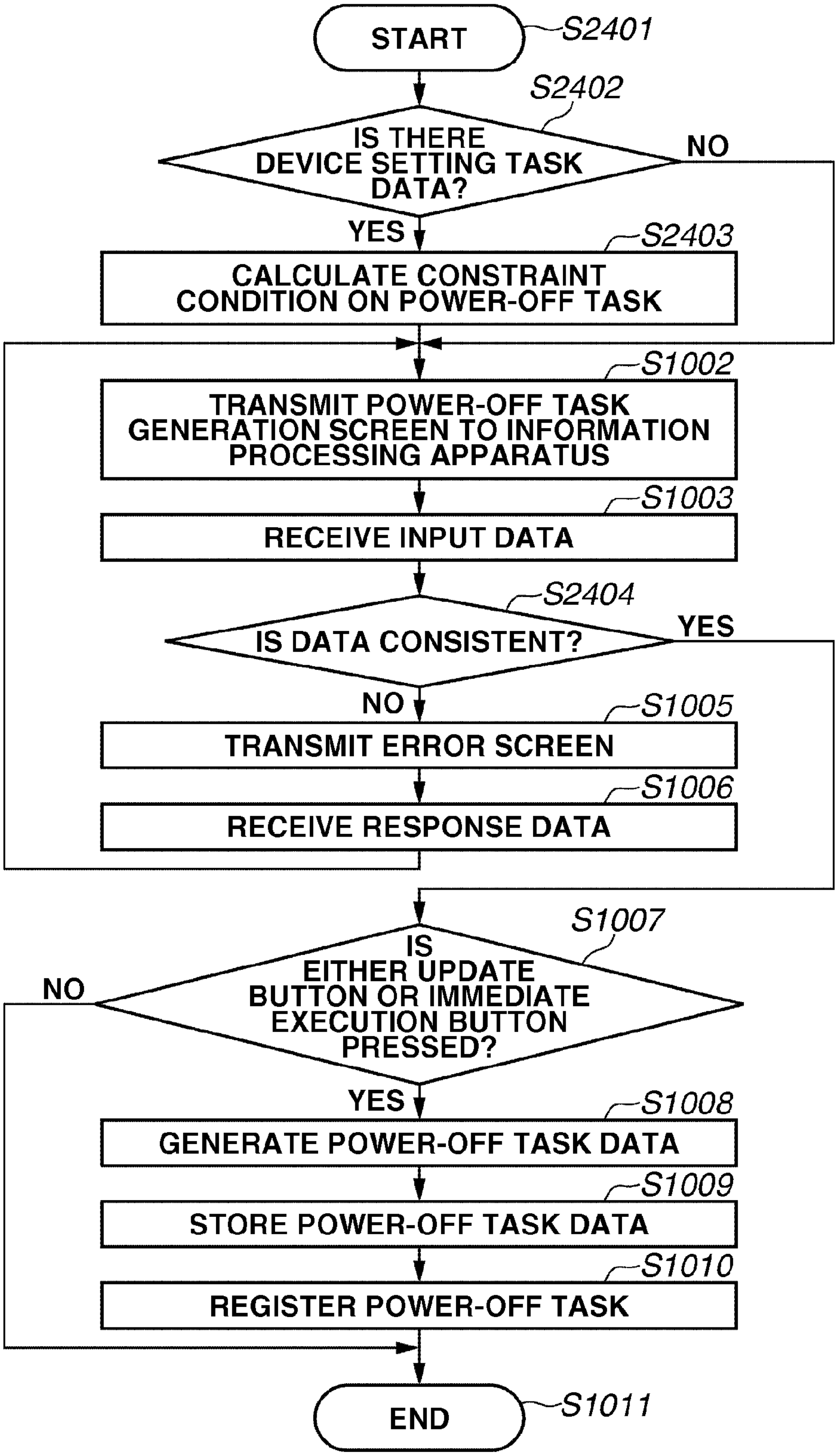
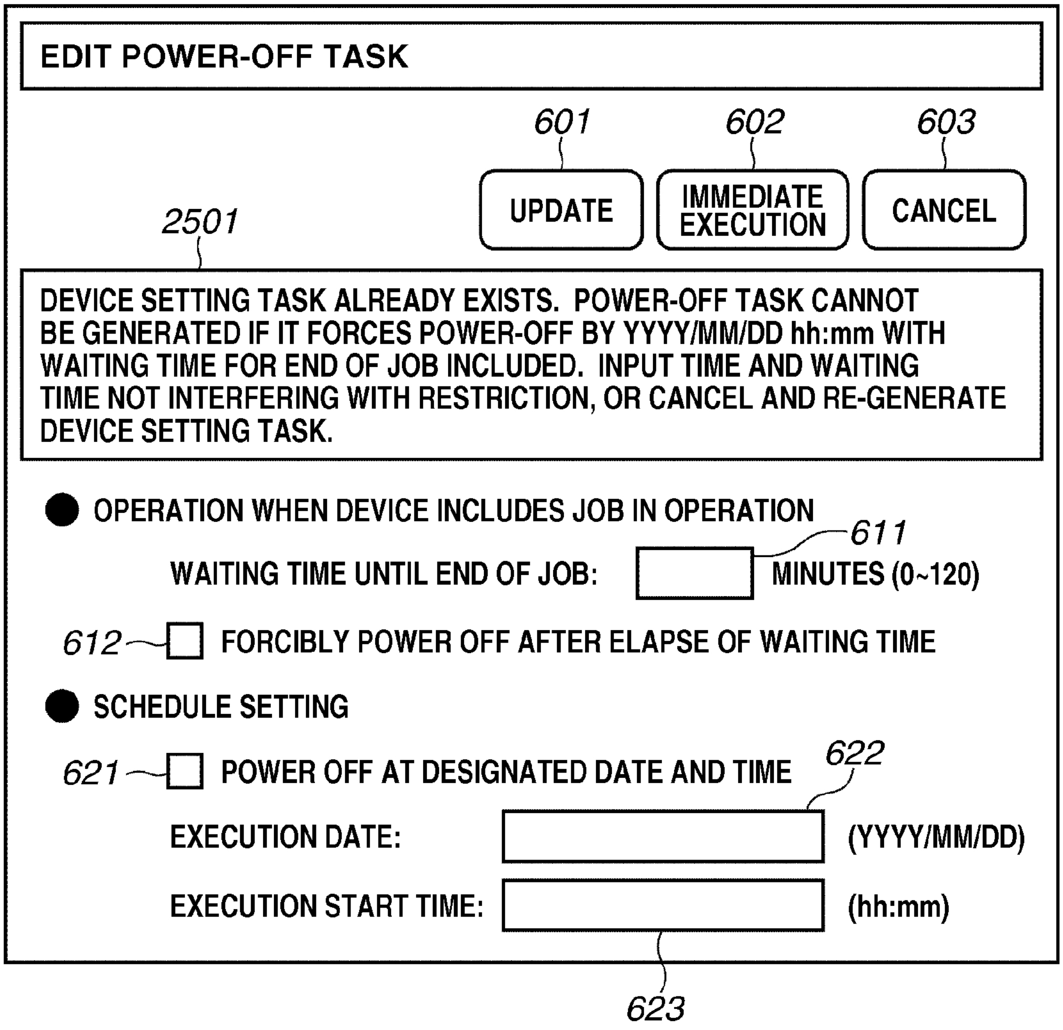

START
S2401
S2402
IS THERE DEVICE SETTING TASK DATA?
NO
YES
S2403
CALCULATE CONSTRAINT CONDITION ON POWER-OFF TASK
S1002
TRANSMIT POWER-OFF TASK GENERATION SCREEN TO INFORMATION PROCESSING APPARATUS
S1003
RECEIVE INPUT DATA
S2404
IS DATA CONSISTENT?
YES
NO
S1005
TRANSMIT ERROR SCREEN
S1006
RECEIVE RESPONSE DATA
S1007
IS EITHER UPDATE BUTTON OR IMMEDIATE EXECUTION BUTTON PRESSED?
NO
YES
S1008
GENERATE POWER-OFF TASK DATA
S1009
STORE POWER-OFF TASK DATA
S1010
REGISTER POWER-OFF TASK
END
S1011

FIG.25



EDIT POWER-OFF TASK

DEVICE SETTING TASK ALREADY EXISTS. POWER-OFF TASK CANNOT BE GENERATED IF IT FORCES POWER-OFF BY YYYY/MM/DD hh:mm WITH WAITING TIME FOR END OF JOB INCLUDED. INPUT TIME AND WAITING TIME NOT INTERFERING WITH RESTRICTION, OR CANCEL AND RE-GENERATE DEVICE SETTING TASK.

● OPERATION WHEN DEVICE INCLUDES JOB IN OPERATION

WAITING TIME UNTIL END OF JOB: MINUTES (0~120)

□ FORCIBLY POWER OFF AFTER ELAPSE OF WAITING TIME

● SCHEDULE SETTING

□ POWER OFF AT DESIGNATED DATE AND TIME

EXECUTION DATE: (YYYY/MM/DD)

EXECUTION START TIME: (hh:mm)

FIG.26A

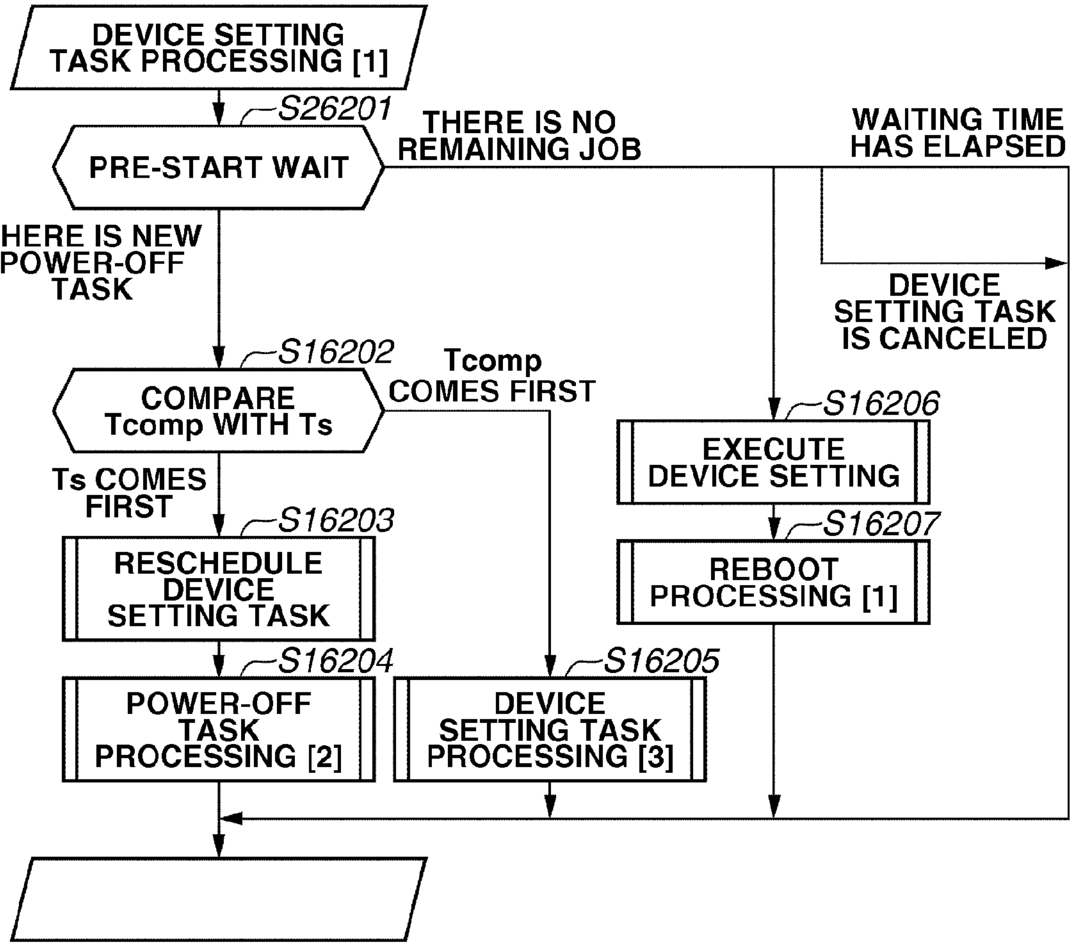

DEVICE SETTING TASK PROCESSING [1]
S26201
PRE-START WAIT
THERE IS NO REMAINING JOB
WAITING TIME HAS ELAPSED
THERE IS NEW POWER-OFF TASK
DEVICE SETTING TASK IS CANCELED
S16202
COMPARE Tcomp WITH Ts
Tcomp COMES FIRST
S16206
EXECUTE DEVICE SETTING
Ts COMES FIRST
S16203
RESCHEDULE DEVICE SETTING TASK
S16207
REBOOT PROCESSING [1]
S16204
POWER-OFF TASK PROCESSING [2]
S16205
DEVICE SETTING TASK PROCESSING [3]

FIG.26B

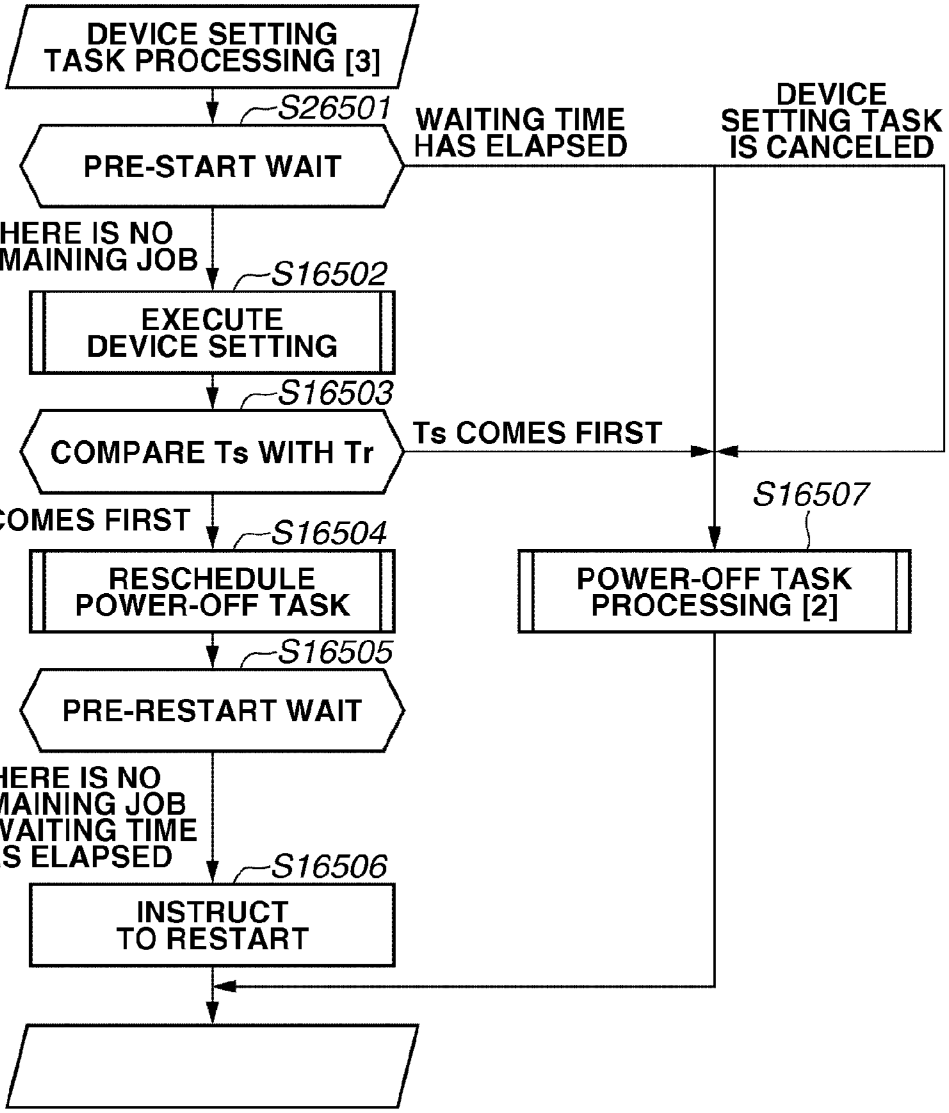
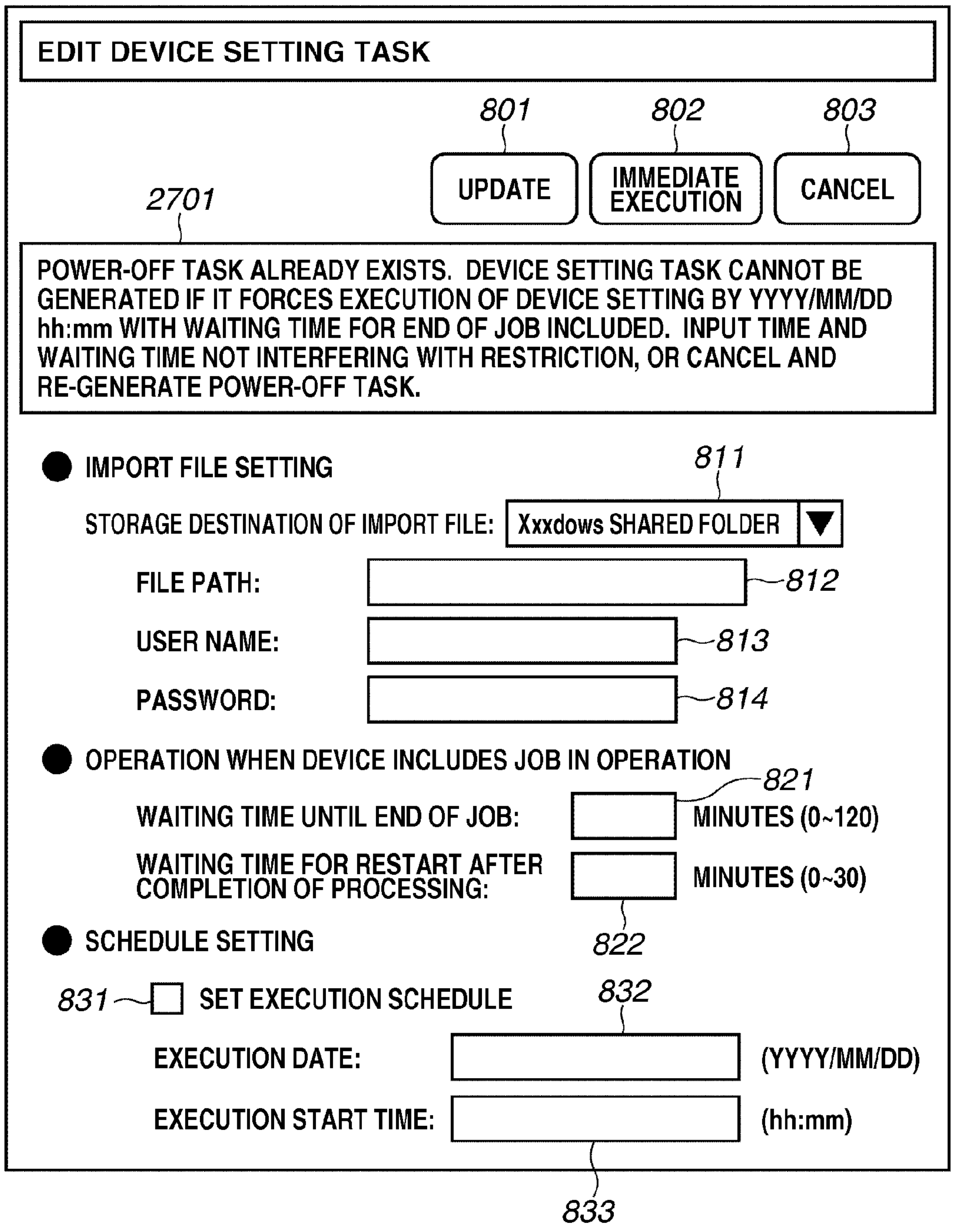

DEVICE SETTING TASK PROCESSING [3]
S26501
PRE-START WAIT
WAITING TIME HAS ELAPSED
DEVICE SETTING TASK IS CANCELED
THERE IS NO REMAINING JOB
S16502
EXECUTE DEVICE SETTING
S16503
COMPARE Ts WITH Tr
Ts COMES FIRST
Tr COMES FIRST
S16504
RESCHEDULE POWER-OFF TASK
S16507
POWER-OFF TASK PROCESSING [2]
S16505
PRE-RESTART WAIT
THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED
S16506
INSTRUCT TO RESTART

FIG.27



EDIT DEVICE SETTING TASK

POWER-OFF TASK ALREADY EXISTS. DEVICE SETTING TASK CANNOT BE GENERATED IF IT FORCES EXECUTION OF DEVICE SETTING BY YYYY/MM/DD hh:mm WITH WAITING TIME FOR END OF JOB INCLUDED. INPUT TIME AND WAITING TIME NOT INTERFERING WITH RESTRICTION, OR CANCEL AND RE-GENERATE POWER-OFF TASK.

● IMPORT FILE SETTING

STORAGE DESTINATION OF IMPORT FILE: Xxxdows SHARED FOLDER ▼

FILE PATH:

USER NAME:

PASSWORD:

● OPERATION WHEN DEVICE INCLUDES JOB IN OPERATION

WAITING TIME UNTIL END OF JOB: MINUTES (0~120)

WAITING TIME FOR RESTART AFTER COMPLETION OF PROCESSING: MINUTES (0~30)

● SCHEDULE SETTING

□ SET EXECUTION SCHEDULE

EXECUTION DATE: (YYYY/MM/DD)

EXECUTION START TIME: (hh:mm)

FIG.28

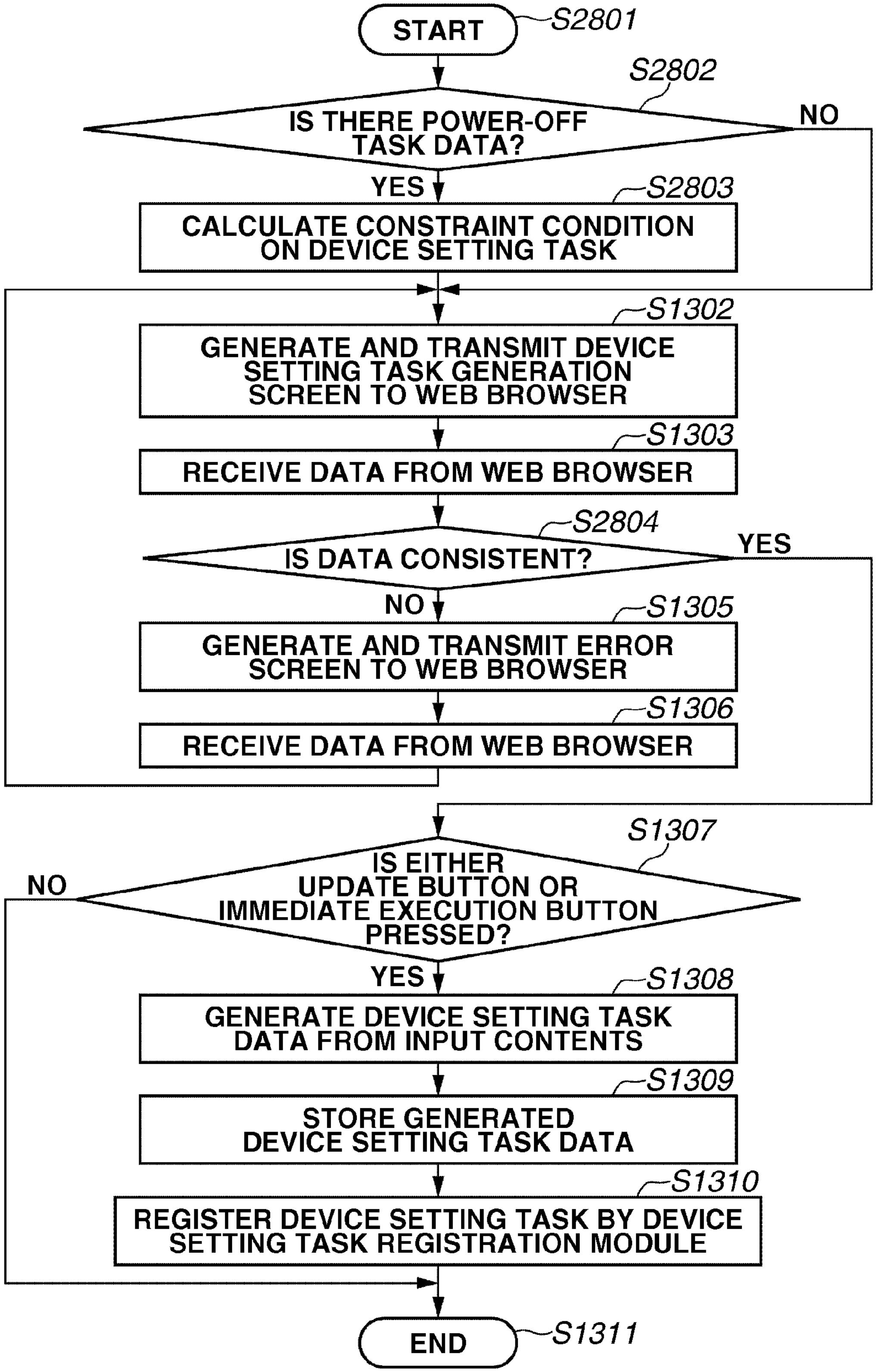

START
S2801
IS THERE POWER-OFF TASK DATA?
S2802
NO
YES
CALCULATE CONSTRAINT CONDITION ON DEVICE SETTING TASK
S2803
GENERATE AND TRANSMIT DEVICE SETTING TASK GENERATION SCREEN TO WEB BROWSER
S1302
RECEIVE DATA FROM WEB BROWSER
S1303
IS DATA CONSISTENT?
S2804
YES
NO
GENERATE AND TRANSMIT ERROR SCREEN TO WEB BROWSER
S1305
RECEIVE DATA FROM WEB BROWSER
S1306
IS EITHER UPDATE BUTTON OR IMMEDIATE EXECUTION BUTTON PRESSED?
S1307
NO
YES
GENERATE DEVICE SETTING TASK DATA FROM INPUT CONTENTS
S1308
STORE GENERATED DEVICE SETTING TASK DATA
S1309
REGISTER DEVICE SETTING TASK BY DEVICE SETTING TASK REGISTRATION MODULE
S1310
END
S1311

IMAGE FORMING APPARATUS AND CONTROL METHOD FOR ENABLING PROPER EXECUTION OF SETTING AND POWER-OFF OF THE IMAGE FORMING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image forming apparatus and a method for controlling the image forming apparatus.

2. Description of the Related Art

Conventional management systems of a network device (hereinafter, referred to as a device) such as an image forming apparatus include ones having a function of powering off the device, a function of executing device setting, and a function of subsequently restarting the device to apply the change in setting.

Some management systems are capable of immediately executing such functions according to an instruction from an administrator and/or automatically executing the functions according to a schedule setting.

The functions may be scheduled to be automatically executed in an overlapping manner. Some management systems have a function of performing at least either one of the functions at a shifted time to prevent a power-off from being executed during device setting (See Japanese Patent Application Laid-Open No. 2010-004335).

With such conventional network device management systems, a power-off can be executed during device setting if the administrator gives an instruction to immediately execute the functions. In such a case, the conventional network device management systems have not been able to prevent the power-off from interfering with proper changing of the device setting.

The conventional network device management systems have also not been able to properly execute a power-off, whether instructed to be immediately executed or automatically executed according to a schedule setting, if the time to execute the power-off passes during a restart.

In such a case, it has not been possible to prevent the device from being kept powered on at a time when the device is supposed to be powered off. Abrupt disconnection of an external power supply can cause a device failure. If the external power supply to the device is known to be disconnected at a specific time for outage or maintenance purposes in advance, it is important to power off the device by that time. According to the conventional technology, the device has often been left not powered off at the time.

SUMMARY OF THE INVENTION

The present invention is directed to a method for enabling proper execution of setting and a power-off of an image forming apparatus even if the setting, an accompanying restart, and the power-off of the image forming apparatus are instructed to be executed immediately or according to a schedule setting in an overlapping manner.

According to an aspect of the present invention, an image forming apparatus includes a first designation unit configured to designate a power-off task of shutting down the image forming apparatus in a designated period, a second designation unit configured to designate a setting task of executing a setting process for setting a setting item of the image forming apparatus in a designated period and a restart process for restarting the image forming apparatus after the setting process, and a task control unit configured to control execution of

the designated power-off task and the designated setting task, wherein the task control unit is configured to, if the power-off task is designated, perform control to change processing of the power-off task and the setting task according to which of the processes of the setting task a period that an end of the designated period of the power-off task reaches corresponds to.

Further features and aspects of the present invention will become apparent from the following detailed description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate exemplary embodiments, features, and aspects of the invention and, together with the description, serve to explain the principles of the invention.

FIG. **1** is a diagram illustrating an example of a system to which an image forming apparatus according to a first exemplary embodiment can be applied.

FIG. **2** is a block diagram schematically illustrating apart of a configuration of a multifunction peripheral (MFP).

FIG. **3** is a block diagram schematically illustrating a configuration of an information processing apparatus.

FIG. **4** is a block diagram illustrating an internal configuration of network management software of a network device management system according to the first exemplary embodiment, the network management software running on a controller of the MFP.

FIG. **5** is a diagram schematically illustrating a data configuration of power-off task data.

FIG. **6** is a diagram schematically illustrating a power-off task generation screen which a power-off task generation module displays on a web browser running on the information processing apparatus via a network by using a servlet and from which the administrator can generate a power-off task.

FIG. **7** is a diagram schematically illustrating a data configuration of device setting task data.

FIG. **8** is a diagram schematically illustrating a device setting task generation screen which a device setting task generation module displays on a web browser running on the information processing apparatus via the network by using a servlet and from which the administrator can generate a device setting task.

FIG. **9** is a diagram schematically illustrating an error screen.

FIG. **10** is a flowchart illustrating an example of a procedure by which the power-off task generation module generates a power-off task.

FIG. **11** is a diagram schematically illustrating schedule data for a timer unit to process.

FIG. **12** is a flowchart illustrating an example of a procedure by which a power-off task registration module registers a power-off task.

FIG. **13** is a flowchart illustrating an example of a procedure by which the device setting task generation module generates a device setting task.

FIG. **14** is a flowchart illustrating an example of a procedure by which a device setting task registration module registers a device setting task.

FIG. **15** is a flowchart illustrating an example of a procedure by which a timer notification module calls a scheduled task.

FIG. **16**A is a flowchart illustrating main processing of a task control unit.

FIG. **16**B is a flowchart illustrating power-off task processing [**1**] of the task control unit.

FIG. **16**C is a flowchart illustrating device setting task processing [**1**] of the task control unit.

FIG. **16**D is a flowchart illustrating power-off task processing [**2**] of the task control unit.

FIG. **16**E is a flowchart illustrating device setting task processing [**2**] of the task control unit.

FIG. **16**F is a flowchart illustrating device setting task processing [**3**] of the task control unit.

FIG. **16**G is a flowchart illustrating reboot processing [**1**] of the task control unit.

FIG. **17** is a diagram schematically illustrating a power-off task cancel screen which the task control unit displays on a web browser running on the information processing apparatus via the network by using a servlet and from which the administrator can cancel a power-off task.

FIG. **18** is a flowchart illustrating power-off task processing [**2**] of the task control unit according to a second exemplary embodiment.

FIG. **19** is a flowchart illustrating power-off task processing [**2**] of the task control unit according to a third exemplary embodiment.

FIG. **20** is a block diagram illustrating an example of an internal configuration of network device management software according to the second exemplary embodiment.

FIG. **21**A is a flowchart illustrating device setting task processing [**2**] of the task control unit according to a fourth exemplary embodiment.

FIG. **21**B is a flowchart illustrating reboot processing [**1**] of the task control unit according to the fourth exemplary embodiment.

FIG. **22** is a diagram schematically illustrating a data configuration of power-off task data according to the fourth exemplary embodiment.

FIG. **23** is diagram schematically illustrating a device setting task cancel screen which the task control unit displays on a web browser running on the information processing apparatus via the network by using a servlet and from which the administrator can cancel a device setting task.

FIG. **24** is a flowchart illustrating an example of a procedure by which a power-off task generation module according to a fifth exemplary embodiment generates a power-off task.

FIG. **25** is a diagram schematically illustrating a power-off task generation screen which the power-off task generation module according to the fifth exemplary embodiment displays on a web browser running on the information processing apparatus via the network by using a servlet and from which the administrator can generate a power-off task.

FIG. **26**A is a flowchart illustrating device setting task processing [**1**] of the task control unit according to the fifth exemplary embodiment.

FIG. **26**B is a flowchart illustrating device setting task processing [**3**] of the task control unit according to the fifth exemplary embodiment.

FIG. **27** is a diagram schematically illustrating a device setting task generation screen which a device setting task generation module according to a sixth exemplary embodiment displays on a web browser running on the information processing apparatus via the network by using a servlet and from which the administrator can generate a device setting task.

FIG. **28** is a flowchart illustrating an example of a procedure by which the device setting task generation module according to the sixth exemplary embodiment generates a device setting task.

DESCRIPTION OF THE EMBODIMENTS

Various exemplary embodiments, features, and aspects of the invention will be described in detail below with reference to the drawings.

FIG. **1** is a diagram illustrating an example of a system to which an image forming apparatus according to a first exemplary embodiment can be applied.

In FIG. **1**, an image forming apparatus (hereinafter, referred to as an MFP) **102** is connected to a network **101**. An information processing apparatus **103** is also connected to the network **101**.

FIG. **2** is a block diagram schematically illustrating a part of a configuration of the MFP **102**.

In FIG. **2**, the MFP **102** includes a control unit **201**. A controller **202** is a main body portion of the control unit **201**. The controller **202** includes a central processing unit (CPU), a read-only memory (ROM), and a random access memory (RAM), which are not illustrated. The CPU executes programs stored in the ROM to control the entire MFP **102** in a comprehensive manner.

The control unit **201** includes a storage **203** such as a hard disk drive (HDD) or a solid state drive (SSD), and an operation panel **204**. The control unit **201** is connected to the network **101** via a network interface **205**. An engine interface **206** is connected to an image forming engine (not illustrated) of the MFP **102**. A power supply control interface **207** is connected to a power supply unit (not illustrated) of the MFP **102**.

FIG. **3** is a block diagram schematically illustrating a configuration of the information processing apparatus **103**.

In FIG. **3**, the information processing apparatus **103** includes a main body **301**, which includes a CPU **302**, a bus **303**, and a RAM **304**. The bus **303** is connected to the CPU **302**.

The main body **301** also includes a ROM **305**. The information processing apparatus **103** is connected to the network **101** via a network interface **306**. Examples of a storage **308** include an HDD or an SSD.

The information processing apparatus **103** also includes a human interface device (hereinafter, referred to as HID) interface **307**, an input device **309** such as a keyboard and a mouse, and an output device **310** such as a display and a speaker. The input device **309** and the output device **310** are connected to the HID interface **307**.

FIG. **4** is a block diagram illustrating an internal configuration of network management software of a network device management system according to the first exemplary embodiment. The network management software runs on the controller **202** of the MFP **102**.

In FIG. **4**, the entire network management software **401** corresponds to functions that the CPU inside the controller **202** implements by executing programs stored in the internal ROM.

The network management software **401** includes a timer unit **411**, a job detection unit **412**, a task control unit **413**, a power-off task providing unit **414**, and a device setting task providing unit **415**.

The power-off task providing unit **414** includes a power-off task generation module **421**, a power-off execution module **422**, a power-off task data storage module **423**, and a power-off task registration module **424**. The power-off execution module **422** executes a power-off (shutdown) of the MFP **102**. The modules **421** to **424** will be described in detail below.

The device setting task providing unit **415** includes a device setting task generation module **431**, a device setting value acquisition module **432**, a device setting execution module **433**, a restart execution module **434**, a device setting task data storage module **435**, and a device setting task registration module **436**. The modules **431** to **436** will be described in detail below.

The timer unit **411** includes a timer notification module **441** and a schedule data storage module **442**. The modules **441** and **442** will be described in detail below.

FIG. **5** is a diagram schematically illustrating a data configuration of power-off task data.

The power-off task generation module **421** generates power-off task data. The power-off task data is stored in the power-off task data storage module **423**.

The configuration of the power-off task data will be described below. An immediate flag **501** determines whether to execute the power-off task immediately or according to a schedule. A start time **502** is set if the power-off task is to be executed according to a schedule. Even if the power-off task is to be immediately executed, the power-off task generation module **421** may store the current time as the start time **502** when generating the power-off task data. A job wait maximum waiting time **503** determines an upper limit of waiting time for performing a job wait before actually executing a power-off.

A forced off flag **504** determines whether to forcibly execute a power-off if a job still exists after the lapse of the job wait maximum waiting time **503**. By using the forced off flag **504**, the administrator can instruct whether to issue a forced execution instruction to forcibly execute the power-off task even if execution of a waited job does not end within a designated period (before the lapse of the job wait maximum waiting time **503** since the start time **502**).

FIG. **6** is a diagram schematically illustrating a power-off task generation screen which the power-off task generation module **421** displays on a web browser running on the information processing apparatus **103** via the network **101** by using a servlet and from which the administrator can generate a power-off task.

In FIG. **6**, an update button **601** is operable to update a setting or settings of a power-off task based on inputs on the screen. An immediate execution button **602** is operable to immediately execute a power-off task based on inputs on the screen. A cancel button **603** is operable to end the screen without setting a power-off task.

A job wait maximum waiting time entry field **611** is operable for the administrator to input the job wait maximum waiting time **503**. A forced power-off check box **612** is operable for the administrator to designate the value of the forced off flag **504**.

A schedule setting check box **621** is operable for the administrator to designate whether to execute the power-off task according to a schedule. A start time date section entry field **622** is operable for the administrator to input a date section of the start time **502** if the power-off task is to be executed according to a schedule. A start time time-section entry field **623** is operable for the administrator to input a time section of the start time **502** if the power-off task is to be executed according to a schedule.

Details of a procedure by which the power-off task generation module **421** generates a power-off task are illustrated in FIG. **10** to be described below.

FIG. **7** is a diagram schematically illustrating a data configuration of device setting task data.

The device setting task generation module **431** generates device setting task data. The device setting task data is stored in the device setting task data storage module **435**.

In FIG. **7**, an immediate flag **701** determines whether to execute the device setting task immediately or according to a schedule. A start time **702** is set if the device setting task is to be executed according to a schedule.

A storage destination type **703** indicates the type of a storage destination of a device setting value file for the device setting value acquisition module **432** to acquire. A file path **704** indicates the file path of the device setting value file for the device setting value acquisition module **704** to acquire. The device setting value file is a file containing setting items and setting values of the device to be set by the device setting task. The administrator generates the device setting value file in advance and stores the device setting value file in a storage location on the network **101**, accessible from the MFP **102** (for example, Windows (registered trademark) shared file inside the information processing apparatus **103**). Possible settings of the storage destination type **703** include a Windows (registered trademark) shared file and the storage **203** in the MFP **102**.

A user name **705** indicates the user name of a user for the device setting value acquisition module **432** to use when accessing the device setting value file. A password **706** indicates the password of the user for the device setting value acquisition module **432** to use when accessing the device setting value file.

A setting processing pre-start job wait maximum waiting time **707** determines an upper limit of waiting time for performing a job wait before starting processing for importing device setting values in the device setting task. A pre-restart job wait maximum waiting time **708** determines an upper limit of waiting time for performing a job wait before executing a restart after the processing for importing the device setting values in the device setting task is completed.

FIG. **8** is a diagram schematically illustrating a device setting task generation screen which the device setting task generation module **431** displays on a web browser running on the information processing apparatus **103** via the network **101** by using a servlet and from which the administrator can generate a device setting task.

In FIG. **8**, an update button **801** is operable to update a setting or settings of a device setting task based on inputs on the screen. An immediate execution button **802** is operable to immediately execute a device setting task based on inputs on the screen. A cancel button **803** is operable to end the screen without setting a device setting task.

A storage destination type designation drop-down box **811** is operable to select a storage destination type **703**. Alternatives include a Windows (registered trademark) shared folder and a file transfer protocol (FTP) server.

A file path entry field **812** is operable for the administrator to input the file path **704**. A user name entry field **813** is operable for the administrator to input the user name **705** of the user that is used when accessing the file path **704**. A password entry field **814** is operable for the administrator to input the password **706** of the user.

A setting processing pre-start job wait maximum waiting time entry field **821** is operable for the administrator to input the setting processing pre-start job wait maximum waiting time **707** of the device setting task to generate. A pre-restart job wait maximum waiting time entry field **822** is operable for the administrator to input the pre-restart job wait maximum waiting time **708** of the device setting task to generate.

An execution schedule setting enabling check box **831** is operable for the administrator to designate whether to set an execution schedule. A start time date section entry field **832** is operable for the administrator to input a date section of the start time **702**. A start time time-section entry field **833** is operable for the administrator to input a time section of the start time **702**.

Details of a procedure by which the device setting task generation module **431** generates a device setting task are illustrated in FIG. **13** to be described below.

FIG. **9** is a diagram schematically illustrating an error screen.

Suppose that the administrator makes inconsistent inputs on the power-off task generation screen (FIG. **6**) or the device setting task generation screen (FIG. **8**). If the administrator then presses the update button **601** or **801** or the immediate execution button **602** or **802**, the power-off task generation module **421** or the device setting task generation module **431** determines that an error has occurred.

In such a case, the power-off task generation module **621** or the device setting task generation module **431** displays the error screen on a web browser of the information processing apparatus **103** via the network **101** by using a servlet. When a confirm button **901** is pressed, the power-off task generation module **621** or the device setting task generation module **431** closes the error screen.

Power-off task generation processing will be described below with reference to the flowchart of FIG. **10**.

FIG. **10** is a flowchart illustrating an example of the procedure by which the power-off task generation module **421** generates a power-off task. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

The power-off task generation module **421** initially receives a request to generate a power-off task from the information processing apparatus **103**. In step S**1001**, the power-off task generation module **421** starts the processing.

In step S**1002**, the power-off task generation module **421** generates and transmits the power-off task generation screen (FIG. **6**) to the information processing apparatus **103**. A web browser is running on the information processing apparatus **103**. The administrator inputs necessary information on the web browser and presses the update button **601** or the immediate execution button **602**, or presses the cancel button **603** without inputting any particular information. After such operations, the information processing apparatus **103** transmits input data to the power-off task generation module **421**.

In step S**1003**, the power-off task generation module **421** receives the input data transmitted from the information processing apparatus **103**.

In step S**1004**, the power-off task generation module **421** checks whether the input data is consistent.

If the input data is determined not to be consistent (NO in step S**1004**), the power-off task generation module **421** advances the processing to step S**1005**.

In step S**1005**, the power-off task generation module **421** generates and transmits the error screen (FIG. **9**) to the information processing apparatus **103**. The web browser running on the information processing apparatus **103** draws the error screen (FIG. **9**). The administrator examines the contents of the error screen and presses the confirm button **901**. The information processing apparatus **103** transmits response data indicating that the confirm button **901** is pressed to the power-off task generation module **421**.

In step S**1006**, the power-off task generation module **421** receives the response data indicating that the confirm button **901** is pressed, and performs control to return to step S**1002** and continue the processing.

If, in step S**1004**, the input data is determined to be consistent (YES in step S**1004**), the power-off task generation module **421** advances the processing to step S**1007**.

In step S**1007**, the power-off task generation module **421** examines the contents of the input data to check whether the button the administrator has pressed is either of the update button **601** and the immediate execution button **602**.

If the pressed button is determined to be neither the update button **601** nor the immediate execution button **602** (NO in step S**1007**), the pressed button turns out to be the cancel button **603**. In step S**1011**, the power-off task generation module **421** simply ends the power-off task generation processing.

On the other hand, if the pressed button is determined to be either the update button **601** or the immediate execution button **602** (YES in step S**1007**), the power-off task generation module **421** advances the processing to step S**1008**.

In step S**1008**, the power-off task generation module **421** generates power-off task data (FIG. **5**) from the contents of the input data.

In step S**1009**, the power-off task generation module **421** stores the power-off task data generated in step S**1008** into the power-off task data storage module **423**.

In step S**1010**, the power-off task generation module **421** calls the power-off task registration module **424** to register a power-off task corresponding to the power-off task data stored in step S**1009**. The power-off task generation module **421** passes a pointer of the power-off task data corresponding to the task to be registered to the power-off task registration module **424**. The pointer indicates the storage location of the power-off task data in the power-off task data storage module **423**. By such registration processing, schedule data (FIG. **11**) on the power-off task is stored into the schedule data storage module **442**. Details of the processing for registering a power-off task are illustrated in FIG. **12**. After the registration of the power-off task is completed, then in step S**1011**, the power-off task generation module **421** completes the power-off task generation processing.

Schedule data will be described with reference to FIG. **11**.

FIG. **11** is a diagram schematically illustrating schedule data for the timer unit **411** to process.

In FIG. **11**, the schedule data includes a set time **1101** of the schedule, data **1102** indicating a schedule type (a power-off task or a device setting task), and a pointer **1103** to power-off task data or device setting task data.

Power-off task registration processing will be described below with reference to the flowchart of FIG. **12**.

FIG. **12** is a flowchart illustrating an example of a procedure by which the power-off task registration module **424** registers a power-off task. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

The power-off task generation module **421** initially calls the power-off task registration module **424**. In step S**1201**, the power-off task registration module **424** starts the processing. The power-off task registration module **424**, when called, receives the pointer (indicating the storage location in the power-off task data storage module **423**) of the power-off task data corresponding to the task to be registered from the power-off task generation module **421**.

In step S**1202**, the power-off task registration module **424** determines whether the task to be registered is designated to be executed according to a schedule or designated to be immediately executed, based on the power-off task data read from the pointer designated by the power-off task generation module **421**.

If the task is determined to be designated to be executed according to a schedule (YES in step S**1202**), the power-off task registration module **424** advances the processing to step S**1203**.

In step S**1203**, the power-off task registration module **424** generates schedule data (FIG. **11**) based on the power-off task data read from the pointer designated by the power-off task generation module **421**.

In step S**1204**, the power-off task registration module **424** stores the schedule data generated in step S**1203** into the schedule data storage module **442** of the timer unit **411**. In step S**1206**, the power-off task registration module **424** completes the processing. When the schedule data is stored into the schedule data storage module **442**, the set time **1101** is registered into a timer. When the set time **1101** is reached to produce a signal, the timer notification module **441** makes a notification to the task control unit **413**. Note that the set time **1101** of the schedule data stored in the schedule data storage module **442** is also registered into the timer when the MFP **102** is restarted. The timer unit **411** is capable of registering only one power-off task.

If, in step S**1202**, the task is determined to be not designated to be executed according to a schedule, i.e., to be designated to be immediately executed (NO in step S**1202**), the power-off task registration module **424** advances the processing to step S**1205**.

In step S**1205**, the power-off task registration module **424** passes the pointer of the designated power-off task data to the task control unit **413** for immediate execution. In step S**1206**, the power-off task registration module **424** completes the processing.

Device setting task generation processing will be described below with reference to FIG. **13**.

FIG. **13** is a flowchart illustrating an example of the procedure by which the device setting task generation module **431** generates a device setting task. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

The device setting task generation module **431** initially receives a request to generate a device setting task from the information processing apparatus **103**. In step S**1301**, the device setting task generation module **431** starts the processing.

In step S**1302**, the device setting task generation module **431** generates and transmits the device setting task generation screen (FIG. **8**) to the information processing unit **103**. A web browser is running on the information processing apparatus **103**. The administrator inputs necessary information and presses the update button **801** or the immediate execution button **802**, or presses the cancel button **803** without inputting any particular information. After such operations, the information processing apparatus **103** transmits input data to the device setting task generation module **431**.

In step S**1303**, the device setting task generation module **431** receives the input data transmitted from the information processing apparatus **103**.

In step S**1304**, the device setting task generation module **431** checks whether the input data is consistent.

If the input data is determined not to be consistent (NO in step S**1304**), the device setting task generation module **431** advances the processing to step S**1305**.

In step S**1305**, the device setting task generation module **431** generates and transmits the error screen (FIG. **9**) to the information processing apparatus **103**. The web browser running on the information processing apparatus **103** draws the error screen (FIG. **9**). The administrator examines the contents of the error screen and presses the confirm button **901**. The information processing apparatus **103** transmits response data indicating that the confirm button **901** is pressed to the device setting task generation module **431**.

In step S**1306**, the device setting task generation module **431** receives the response data indicating that the confirm button **901** is pressed, and performs control to return to step S**1302** and continue the processing.

If, in step S**1304**, the input data is determined to be consistent (YES in step S**1304**), the device setting task generation module **431** advances the processing to step S**1307**.

In step S**1307**, the device setting task generation module **431** examines the contents of the input data to check whether the button the administrator has pressed is either of the update button **801** or the immediate execution button **802**.

If the pressed button is determined to be neither of the update button **801** and the immediate execution button **802** (NO in step S**1307**), the pressed button turns out to be the cancel button **803**. In step S**1311**, the device setting task generation module **431** simply completes the device setting task generation processing.

On the other hand, if the pressed button is determined to be either the update button **801** or the intermediate execution button **802** (YES in step S**1307**), the device setting task generation module **431** advances the processing to step S**1308**.

In step S**1308**, the device setting task generation module **431** generates device setting task data (FIG. **7**) from the contents of the input data.

In step S**1309**, the device setting task generation module **431** stores the device setting task data into the device setting task data storage module **435**.

In step S**1310**, the device setting task generation module **431** calls the device setting task registration module **436** to register a device setting task corresponding to the device setting task data stored into the device setting task data storage module **435** in step S**1309**. The device setting task generation module **431** passes a pointer of the device setting task data corresponding to the task to be registered to the device setting task registration module **436**. The pointer indicates the storage location of the device setting task data in the device setting task data storage module **435**. By such registration processing, schedule data (FIG. **11**) on the device setting task is stored into the schedule data storage module **442**. Details of the processing for registering a device setting task are illustrated in FIG. **14**. After the registration of the device setting task is completed, then in step S**1311**, the device setting task generation module **431** completes the device setting task generation processing.

Device setting task registration processing will be described below with reference to the flowchart of FIG. **14**.

FIG. **14** is a flowchart illustrating an example of a procedure by which the device setting task registration module **436** registers a device setting task. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

The device setting task generation module **431** initially calls the device setting task registration module **436**. In step S**1401**, the device setting task registration module **436** starts the processing. The device setting task registration module **436**, when called, receives the pointer (indicating the storage location in the device setting task data storage module **435**) of the device setting task data corresponding to the task to be registered from the device setting task generation module **431**.

In step S**1402**, the device setting task registration module **436** determines whether the task to be registered is designated to be executed according to a schedule or designated to be immediately executed, based on the device setting task data read from the pointer designated by the device setting task generation module **431**.

If the task is determined to be designated to be executed according to a schedule (YES in step S**1402**), the device setting task registration module **436** advances the processing to step S**1403**.

In step S**1403**, the device setting task registration module **436** generates schedule data (FIG. **11**) based on the device setting task data read from the pointer designated by the device setting task generation module **431**.

In step S**1404**, the device setting task registration module **436** stores the schedule data generated in step S**1403** into the schedule data storage module **442** of the timer unit **411**. In step S**1406**, the device setting task registration module **436** completes the processing. When the schedule data is stored into the schedule data storage module **442**, the set time **1101** is registered into a timer. When the set time **1101** is reached to produce a signal, the timer notification module **441** makes a notification to the task control unit **413**. Note that the set time **1101** of the schedule data stored in the schedule data storage module **442** is also registered into the timer when the MFP **102** is restarted. The timer unit **411** is capable of registering only one device setting task.

If, in step S**1402**, the task is determined to be not designated to be executed according to a schedule, i.e., to be designated to be immediately executed (NO in step S**1402**), the device setting task registration module **436** advances the processing to step S**1405**.

In step S**1405**, the device setting task registration module **436** passes the pointer of the designated device setting task data to the task control unit **413**. In step S**1406**, the device setting task registration module **436** completes the processing.

Next, processing for calling a scheduled task will be described with reference to the flowchart of FIG. **15**.

FIG. **15** is a flowchart illustrating an example of a procedure by which the timer notification module **441** calls a scheduled task. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

The timer notification module **441** is called at startup time and at predetermined timing. In step S**1501**, the timer notification module **441** starts the processing.

In step S**1502**, the timer notification module **441** checks whether it is immediately after startup.

If it is determined to be immediately after startup (YES in step S**1502**), the timer notification unit **441** advances the processing to step S**1503**.

In step S**1503**, the timer notification unit **441** determines whether there is a schedule designated for next startup time. More specifically, the timer notification unit **441** determines whether the schedule data storage module **442** contains schedule data (FIG. **11**) in which the set time **1101** has a special time value (99:99) representing "next startup time."

If there is determined to be no schedule designated for next startup time, i.e., the schedule data storage module **442** is determined to contain no schedule data in which the set time **1101** has the special time value (99:99) representing "next startup time" (NO in step S**1503**), the timer notification module **441** advances the processing to step S**1504**.

If, in step S**1502**, it is determined not to be immediately after startup (NO in step S**1502**), the timer notification module **441** advances the processing to step S**1504**.

In step S**1504**, the timer notification module **441** checks whether it is a time registered in the schedule data, i.e., whether the current time has reached the set time **1101** included in each piece of the schedule data (FIG. **11**) stored in the schedule data storage module **442**. Note that the network device management system is configured so that the set time **1101** included in each piece of schedule data is registered into a timer when stored, and that the set time **1101** has been reached can be known by receiving a signal from the timer.

If it is determined not to be a time registered in the schedule data, i.e., the current time is determined not to have reached a set time **1101** registered in the schedule data (NO in step S**1504**), the timer notification module **441** returns to step S**1504** and continues the processing.

On the other hand, if it is determined to be a time registered in the schedule data, i.e., the current time is determined to have reached a set time **1101** registered in the schedule data (YES in step S**1504**), the timer notification module **441** advances the processing to step S**1505**.

If, in step S**1503**, there is determined to be a schedule designated for next startup time, i.e., the schedule data storage module **442** is determined to contain schedule data in which the set time **1101** has the special time value (99:99) representing "next startup time" (YES in step S**1503**), the timer notification module **441** advances the processing to step S**1505**.

In step S**1505**, the timer notification module **441** acquires the schedule data that is determined to have reached the registered time in step S**1504** or the schedule that is determined to be designated for next startup time in step S**1503**.

In step S**1506**, the timer notification module **441** acquires the pointer **1103** to the task data included in the schedule data acquired in step S**1505**.

In step S**1507**, the timer notification module **441** passes the pointer **1103** of the task data acquired in step S**1506** to the task control unit **413**. In step S**1508**, the timer notification module **441** ends the processing. As a result, the task is called and processed.

Processing of a power-off task and a device setting task by the task control unit **413** will be described below with reference to the flowcharts of FIGS. **16**A to **16**G.

FIG. **16**A is a flowchart illustrating main processing of the task control unit **413**. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

The timer notification module **441**, the power-off task registration module **424**, or the device setting task registration module **436** passes a pointer **1103** of task data to the task control unit **413**. In step S**16001**, the task control unit **413** starts the processing.

In step S**16002**, the task control unit **413** reads the task data corresponding to the passed pointer, and checks whether the task data is of a power-off task.

If the task data corresponding to the passed pointer is determined to be of a power-off task (YES in step S**16002**), then in step S**16003**, the task control unit **413** performs power-off task processing [**1**] (FIG. **16**B). Exiting from the power-off task processing [**1**] in step S**16003**, then in step S**16007**, the task control unit **413** ends the processing.

On the other hand, if the task data corresponding to the passed pointer is determined not to be of a power-off task (NO in step S**16002**), the task data is device setting task data. The task control unit **413** advances the processing to step S**16004**.

In step S**16004**, the task control unit **413** refers to the start time **702** of the device setting task data corresponding to the passed pointer, and refers to the power-off task data storage module **423** to check whether there is a power-off task at a time (near time) within predetermined time Ti from the start time **702**.

If there is determined to be no power-off task at a time (near time) within the time Ti from the start time **702** of the device setting task data (NO in step S**16004**), then in step S**16005**, the task control unit **413** performs device setting task processing [**1**] (FIG. **16**C). Exiting from the device setting task processing [1] in step S16005, then in step S16007, the task control unit 413 ends the processing.

On the other hand, if there is determined to be a power-off task at a time (near time) within the time Ti from the start time 702 of the device setting task data (YES in step S16004), then in step S16006, the task control unit 413 performs device setting task processing [2] (FIG. 16E). Exiting from the device setting task processing [2] in step S16006, then in step S16007, the task control unit 413 ends the processing.

Next, the power-off task processing [1] will be described.

FIG. 16B is a flowchart illustrating the power-off task processing [1] of the task control unit 413. The processing of this flowchart is implemented by the CPU inside the controller 202 executing a program stored in the internal ROM.

In step S16101 of the power-off task processing [1], the task control unit 413 initially performs a job wait (power-off wait). In this step, the task control unit 413 waits until time has elapsed as much as the job wait maximum waiting time 503 of the power-off task currently in process, until there becomes no remaining job in the meantime, or until a new device setting task is issued in the meantime.

If a new device setting task is determined to be issued during the job wait in step S16101 ("THERE IS NEW DEVICE SETTING TASK" in step S16101), the task control unit 413 advances the processing to step S16102. The situation where "a new device setting task is issued" refers to when a pointer of new device setting task data is passed to the task control unit 413 (step S1507 of FIG. 15 or step S1405 of FIG. 14).

In step S16102, the task control unit 413 reschedules the device setting task. More specifically, the task control unit 413 generates new device setting task data in which the start time 702 has the special time value "99:99" representing next startup time by using the contents of the task data on the new device setting task issued. The task control unit 413 registers the generated device setting task data by using the device setting task registration module 436. After the registration, the task control unit 413 advances the processing to step S16103.

In step S16103, the task control unit 413 performs power-off task processing [2] (FIG. 16D). Exiting from the power-off task processing [2] in step S16103, the task control unit 413 exits from the power-off task processing [1] and advances the processing to the next step according to the processing procedure of the calling source.

If there is determined to be no remaining job during the job wait in step S16101 ("THERE IS NO REMAINING JOB" in step S16101), the task control unit 413 advances the processing to step S16104. If, in step S16101, there is no job from the beginning, the task control unit 413 also advances the processing to step S16104.

In step S16104, the task control unit 413 instructs the power-off execution module 422 to power off. The task control unit 413 then exits from the power-off task processing [1] and advances the processing to the next step according to the processing procedure of the calling source.

If the job wait maximum waiting time 503 is determined to have elapsed during the job wait in step S16101 ("WAITING TIME HAS ELAPSED" in step S16101), the task control unit 413 advances the processing to step S16105. Such a situation corresponds to the case where all jobs are not completed before the lapse of the job wait maximum waiting time 503.

In step S16105, the task control unit 413 checks whether the forced off flag 504 of the power-off task data is on.

If the forced off flag 504 of the power-off task data is determined to be on (YES in step S16105), the task control unit 413 advances the processing to step S16104 and instructs the power-off execution module 422 to power off.

On the other hand, if the forced off flag 504 of the power-off task data is determined not to be on (NO in step S16105), the task control unit 413 simply exits from the power-off task processing [1] and advances the processing to the next step according to the processing procedure of the calling source. In other words, no power-off is executed according to the user's intention (setting of the forced off flag 504).

Next, the device setting task processing [1] will be described.

FIG. 16C is a flowchart illustrating the device setting task processing [1] of the task control unit 413. The processing of this flowchart is implemented by the CPU inside the controller 202 executing a program stored in the internal ROM.

In step S16201 of the device setting task processing [1], the task control unit 413 initially performs a pre-start wait. In this step, the task control unit 413 waits until time has elapsed as much as the setting processing pre-start job wait maximum waiting time 707 of the device setting task currently in process, until there becomes no remaining job in the meantime, or until a new power-off task is issued in the meantime.

If a new power-off task is determined to be issued during the pre-start wait in step S16201 ("THERE IS NEW POWER-OFF TASK" in step S16201), the task control unit 413 advances the processing to step S16202. The situation where "a new power-off task is issued" refers to when a pointer of new power-off task data is passed to the task control unit 413 (step S1507 of FIG. 15 or step S1205 of FIG. 12).

In step S16202, the task control unit 413 compares a device setting processing completion expected final time Tcomp of the device setting task currently in process with a final execution time Ts of the power-off task. The final execution time Ts of the power-off task refers to a time when the job wait maximum waiting time 503 has elapsed since the start time 502 of the new power-off task. A time when the setting processing pre-start job wait maximum waiting time 707 has elapsed since the start time 702 of the device setting task in process will be referred to as a device setting processing start final time Tw. A maximum amount of time that is expected to be needed for the device setting value acquisition module 432 to acquire a device setting value file will be denoted by Tf. A maximum amount of time Tc that is expected to be needed for the device setting execution module 433 to complete device setting since start of execution will be denoted by Tc. The device setting processing completion expected final time Tcomp at which the device setting execution module 433 is expected to complete executing the device setting is calculated by Tw+Tf+Tc.

If, in step S16202, Tcomp is determined to be greater, i.e., the final execution time Ts of the power-off task is determined to come first ("Ts COMES FIRST" in step S16202), the task control unit 413 advances the processing to step S16203.

In step S16203, the task control unit 413 reschedules the device setting task. More specifically, the task control unit 413 generates new device setting task data in which the start time 702 has the special time value "99:99" representing next startup time by using the contents of the task data of the device setting task currently in process. The task control unit 413 registers the generated device setting task data by using the device setting task registration module 436. After the registration, the task control unit 413 advances the processing to step S16204.

In step S16204, the task control unit 413 performs the power-off task processing [2] (FIG. 16D). Exiting from the power-off task processing [2] in step S16204, the task control unit 413 exits from the device setting task processing [1] and advances the processing to the next step according to the processing procedure of the calling source.

If, in step **S16202**, Ts is determined to be greater, i.e., the device setting processing completion expected final time Tcomp is determined to come first ("Tcomp COMES FIRST" in step **S16202**), the task control unit **413** advances the processing to step **S16205**.

In step **S16205**, the task control unit **413** performs device setting task processing [**3**] (FIG. **16**F). Exiting from the device setting task processing [**3**] in step **S16205**, the task control unit **413** exits from the device setting task processing [**1**] and advances the processing to the next step according to the processing procedure of the calling source.

If there is determined to be no remaining job during the pre-start wait in step **S16201** ("THERE IS NO REMAINING JOB" in step **S16201**), the task control unit **413** advances the processing to step **S16206**.

In step **S16206**, the task control unit **413** executes device setting. To execute the device setting, the task control unit **413** initially causes the device setting value acquisition module **432** to acquire the device setting value file. By using the acquired device setting value file, the task control unit **413** then causes the device setting execution module **433** to execute device setting.

After the completion of the execution of the device setting in step **S16206**, then in step **S16207**, the task control unit **413** performs reboot processing [**1**] (FIG. **16**G). Exiting from the reboot processing [**1**] in step **S16206**, the task control unit **413** exits from the device setting task processing [**1**] and advances the processing to the next step according to the processing procedure of the calling source.

If the setting processing pre-start job wait maximum waiting time **707** is determined to have elapsed during the pre-start wait in step **S16201** ("WAITING TIME HAS ELAPSED" in step **S16201**), the task control unit **413** simply exits from the device setting task processing [**1**] and advances the processing to the next step according to the processing procedure of the calling source.

Next, the power-off task processing [**2**] will be described.

FIG. **16**D is a flowchart illustrating the power-off task processing [**2**] of the task control unit **413**. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

In step **S16301** of the power-off task processing [**2**], the task control unit **413** initially performs a job wait. In this step, the task control unit **413** waits until the job wait maximum waiting time **503** of the task data on the power-off task currently in process has elapsed or until there becomes no remaining job in the meantime. That the job wait maximum waiting time **503** has elapsed refers to the lapse of the job wait maximum waiting time **503** since the start time **502** of the power-off task currently in process.

If there is determined to be no remaining job during the job wait in step **S16301** ("THERE IS NO REMAINING JOB" in step **S16301**), the task control unit **413** advances the processing to step **S16302**.

In step **S16302**, the task control unit **413** instructs the power-off execution module **422** to power off. After the completion of the instruction, the task control unit **413** exits from the power-off task processing [**2**] and advances the processing to the next step according to the processing procedure of the calling source.

If the job wait maximum waiting time **503** is determined to have elapsed during the job wait in step **S16301** ("WAITING TIME HAS ELAPSED" in step **S16301**), the task control unit **413** advances the processing to step **S16303**.

In step **S16303**, the task control unit **413** checks whether the forced off flag **504** is on.

If the forced off flag **504** is determined to be on (YES in step **S16303**), the task control unit **413** advances the processing to step **S16302** and instructs the power-off execution module **422** to power off.

On the other hand, if the forced off flag **504** is determined not to be on (NO in step **S16303**), the task control unit **413** simply exits from the power-off task processing [**2**] and advances the processing to the next step according to the processing procedure of the calling source. In other words, no power-off is executed according to the user's intention (setting of the forced off flag **504**).

Next, the device setting task processing [**2**] will be described.

FIG. **16**E is a flowchart illustrating the device setting task processing [**2**] of the task control unit **413**. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

In step **S16401** of the device setting task processing [**2**], the task control unit **413** initially compares Tcomp of the device setting task currently in process with Ts of the power-off task at a near time.

If Tcomp is determined to be smaller, i.e., the device setting processing completion expected final time Tcomp is determined to come first ("Tcomp COMES FIRST" in step **S16401**), the task control unit **413** advances the processing to step **S16402**.

In step **S16402**, the task control unit **413** performs a pre-start wait. In this step, the task control unit **413** waits until time has elapsed a much as the setting processing pre-start job wait maximum waiting time **707** of the device setting task in process or until there becomes no remaining job in the meantime. That the setting processing pre-start jog wait maximum waiting time **707** has elapsed refers to the lapse of the setting processing pre-start job wait maximum waiting time **707** since the start time **702** of the device setting task in process.

If there is determined to be no remaining job during the pre-start wait in step **S16402** ("THERE IS NO REMAINING JOB" in step **S16402**), the task control unit **413** advances the processing to step **S16403**. In step **S16403**, the task control unit **413** executes device setting. To execute the device setting, the task control unit **413** initially causes the device setting value acquisition module **432** to acquire the device setting value file. By using the acquired device setting, the task control unit **413** then causes the device setting execution module **433** to execute the device setting. After the execution of the device setting, the task control unit **413** advances the processing to step **S16404**.

In step **S16404**, the task control unit **413** compares the final execution time Ts of the power-off task with a time Tr (hereinafter, referred to as a restart completion expected final time Tr). The restart completion expected final time Tr is when a predetermined restart omission determination criterion time Tn (for example, pre-restart job wait maximum waiting time **708**+restart execution time+time corresponding to the starting time of the device) has elapsed since the current time.

If the restart completion expected final time Tr is determined to be smaller (Tr to come first), i.e., Ts exceeds a restart omission determination criterion ("Tr COMES FIRST" in step **S16404**), the task control unit **413** advances the processing to step **S16405** to perform a restart by priority.

In step **S16405**, the task control unit **413** reschedules the power-off task. More specifically, the task control unit **413** generates and registers new power-off task data in which the start time **502** has "99:99" representing execution at next startup time by using the contents of the task data of the foregoing power-off task. The task control unit **413** then deletes the foregoing power-off task. The task control unit **413** then advances the processing to step S**16406**.

In step S**16406**, the task control unit **413** performs a pre-restart wait. In the pre-restart wait, the task control unit **413** waits until there is no remaining job or until the pre-restart job wait maximum waiting time **708** of the device setting task in process has elapsed. When there is no remaining job or the pre-restart job wait maximum waiting time **708** has elapsed, the task control unit **413** advances the processing to step S**16407**.

In step S**16407**, the task control unit **413** instructs the restart execution module **434** to restart. The task control unit **413** exits from the device setting task processing [**2**] and advances the processing to the next step according to the processing procedure of the calling source.

If, in step S**16401**, Ts is determined to come first, i.e., the final execution time Ts of the power-off task is determined to come first ("Ts COMES FIRST" in step S**16401**), the task control unit **413** advances the processing to step S**16408**.

In step S**16408**, the task control unit **413** reschedules the device setting task in process. Specifically, the task control unit **413** generates and registers new device setting task data in which the start time **702** has "99:99" representing execution at next startup time by utilizing the data of the device setting task in process. The task control unit **413** then deletes the device setting task in process for rescheduling. The task control unit **413** then advances the processing to step S**16409**.

If the setting processing pre-start job wait maximum waiting time **707** is determined to have elapsed during the pre-start wait in step S**16402** ("WAITING TIME HAS ELAPSED" in step S**16402**) or if the final execution time Ts of the power-off task is determined to come first in step S**16404** ("Ts COMES FIRST" in step S**16404**), the task control unit **413** also advances the processing to step S**16409**.

In step S**16409**, the task control unit **413** performs the power-off task processing [**2**]. Exiting from the power-off task processing [**2**], the task control unit **413** exits from the device setting task processing [**2**] and advances the processing to the next step according to the processing procedure of the calling source.

Next, the device setting task processing [**3**] will be described.

FIG. **16**F is a flowchart illustrating the device setting task processing [**3**] of the task control unit **413**. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

In step S**16501** of the device setting task processing [**3**], the task control unit **413** initially performs a pre-start wait. In this step, the task control unit **413** waits until the setting processing pre-start job wait maximum waiting time **707** of the device setting task in process has elapsed or until there becomes no remaining job in the meantime. That the setting processing pre-start job wait maximum waiting time **707** has elapsed refers to the lapse of the setting processing pre-start job wait maximum waiting time **707** since the start time **702** of the device setting task in process.

If there is determined to be no remaining job during the pre-start wait in step S**16501** ("THERE IS NO REMAINING JOB" in step S**16501**), the task control unit **413** advances the processing to step S**16402**.

In step S**16402**, the task control unit **413** executes device setting. To execute the device setting, the task control unit **413** initially causes the device setting value acquisition module **432** to acquire the device setting value file. By using the acquired device setting value file, the task control unit **413** then causes the device setting execution module **433** to execute device setting. The task control unit **413** then advances the processing to step S**16503**.

In step S**16503**, the task control unit **413** compares the final execution time Ts of the power-off task with the restart completion expected final time Tr.

If the restart completion expected final time Tr is determined to come first ("Tr COMES FIRST" in step S**16503**), the task control unit **413** determines that a restart will be completed first, and advances the processing to step S**16504**.

In step S**16504**, the task control unit **413** reschedules the power-off task so that the power-off task will be executed at next startup time, and advances the processing to step S**16505**.

In step S**16505**, the task control unit **413** performs a pre-restart wait. In the pre-restart wait, the task control unit **413** waits until there is no remaining job or until the pre-restart job wait maximum waiting time **708** has elapsed. When there is no remaining job or the pre-restart job wait maximum waiting time **708** has elapsed, the task control unit **413** advances the processing to step S**16506**.

In step S**16506**, the task control unit **413** instructs the restart execution module **434** to restart. After the completion of the instruction, the task control unit **413** exits from the device setting task processing [**3**] and advances the processing to the next step according to the processing procedure of the calling source.

If the setting processing pre-start job wait maximum waiting time **707** is determined to have elapsed during the pre-start wait in step S**16501** ("WAITING TIME HAS ELAPSED" in step S**16501**) or if the final execution time Ts of the power-off task is determined to come first in step S**16503** ("Ts COMES FIRST" in step S**16503**), the task control unit **413** advances the processing to step S**16507**.

In step S**16507**, the task control unit **413** performs the power-off task processing [**2**]. Exiting from the power-off task processing [**2**], the task control unit **413** exits from the device setting task processing [**3**] and advances the processing to the next step according to the processing procedure of the calling source.

Next, the reboot processing [**1**] will be described.

FIG. **16**G is a flowchart illustrating the reboot processing [**1**] of the task control unit **413**. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

In step S**16601** of the reboot processing [**1**], the task control unit **413** initially performs a pre-start wait. In this step, the task control unit **413** waits until time has elapsed as much as the setting processing pre-start job wait maximum waiting time **707** of the device setting task in process, until there becomes no remaining job in the meantime, or until a new power-off task is issued in the meantime. That the setting processing pre-start job wait maximum waiting time **707** has elapsed refers to the lapse of the setting processing pre-start job wait maximum waiting time **707** since the start time **702** of the device setting task in process.

If a new power-off task is determined to be issued during the pre-start wait in step S**16601** ("THERE IS NEW POWER-OFF TASK" in step S**16601**), the task control unit **413** advances the processing to step S**16602**.

In step S**16602**, the task control unit **413** compares the final execution time Ts of the power-off task with the restart completion expected final time Tr.

If Tr is determined to come first ("Tr COMES FIRST" in step S**16602**), the task control unit **413** determines that a restart will be completed first, and advances the processing to step S**16603**.

In step S16603, the task control unit 413 reschedules the power-off task so that the power-off task will be performed at next startup time, and advances the processing to step S16604.

In step S16604, the task control unit 413 performs a pre-restart wait. In the pre-restart wait in step S16604, the task control unit 413 waits until there is no remaining job or until the pre-restart job wait maximum waiting time 708 has elapsed. When there is no remaining job or the pre-restart job wait maximum waiting time 708 has elapsed, the task control unit 413 advances the processing to step S16605.

In step S16605, the task control unit 413 instructs the restart execution module 434 to restart. After the completion of the restart instruction, the task control unit 413 exits from the reboot processing [1] and advances the processing to the next step according to the processing procedure of the calling source.

If, in step S16601, there is determined to be no remaining job or the pre-restart job wait maximum waiting time 708 is determined to have elapsed ("THERE IS NO REMAINING JOB OR WAITING TIME HAS ELAPSED" in step S16601), the task control unit 413 advances the processing to step S16606.

If, in step S16602, Ts is determined to come first ("Ts COMES FIRST" in step S16602), the task control unit 413 advances the processing to step S16606.

In step S16606, the task control unit 413 performs the power-off task processing [2]. Exiting from the power-off task processing [2], the task control unit 413 exits from the reboot processing [1] and advances the processing to the next step according to the processing procedure of the calling source.

As has been described above, according to the first exemplary embodiment, device setting and a power-off can be properly performed even if the device setting, an accompanying restart, and the power-off are instructed to be immediately executed or scheduled in an overlapping manner. In particular, a power-off is prevented from being left undone against the user's intention at a time when the power-off is supposed to have surely been performed. This can prevent a device failure from occurring even if an external power supply is disconnected.

In the present exemplary embodiment, the processing of the power-off task providing unit 414 (first designation processing) is configured to designate a power-off task of shutting down the image forming apparatus 102 within a designated period. The processing of the device setting task providing unit 415 (second designation processing) is configured to designate a device setting task of executing a setting process for setting a setting item of the image forming apparatus 102 within a designated period and a restart process for restarting the image forming apparatus 102 after the setting process. If a power-off task is designated, the task control unit 413 performs control to change the processing according to which of a plurality of phases (a pre-start wait, execution of device setting, a pre-restart wait, execution of a restart, and a device startup) of the device setting task the final execution time Ts of the power-off task (i.e., the end of the user-designated period, or the final time when the power-off is allowed) comes in.

For example, if the final execution time Ts (the end of the designated period) of the power-off task falls between the start time 702 of the device setting task and the device setting processing completion expected final time Tcomp (between a pre-start wait and the completion of the execution of the device setting, i.e., within a period between the beginning of the designated period of the device setting task and a date and time when the setting process is estimated to be completed), the task control unit 413 performs control to once cancel the device setting task, reschedule the device setting task so that the device setting task will be executed at next startup time, and execute the power-off task.

If the final execution time Ts (the end of the designated period) of the power-off task falls between immediately after the device setting processing completion expected final time Tcomp of the device setting task and the restart completion expected final time Tr (between immediately after the completion of the execution of the device setting and the completion of a device startup, i.e., within a period between the date and time when the setting process is estimated to be completed and a date and time when the MFP 102 restarted by the restart process is estimated to complete being restarted), the task control unit 413 performs control to execute the device setting included in the device setting task, cancel processing subsequent to the pre-restart wait, and execute the power-off task. In other words, the task control unit 413 performs control to cancel the execution of the restart included in the device setting task, and execute the power-off task.

If the final execution time Ts (the end of the designated period) of the power-of task comes after the restart completion expected final time Tr of the device setting task (after the completion of a device restart, i.e., if the final execution time Ts comes after a date and time when the MFP 102 restarted by the restart process of the setting task is estimated to complete being restarted), the task control unit 413 performs the device setting included in the device setting task, once cancels the power-off task, reschedules the power-off task so that the power-off task will be executed at next startup time, and performs the processing subsequent to the pre-restart wait of the device setting task.

According to the first exemplary embodiment, proper processing can be performed even if device setting, an accompanying restart, and a power-off are instructed in an overlapping manner. Now, suppose that the execution of a restart included in a device setting task is canceled in order to execute a power-off task, and then the power-off task is canceled. In such a case, the device setting can be left unapplied.

Examples include a case where the forced off flag 504 is off and a job still remains even after the lapse of the job wait maximum waiting time 503. Another example is a case where a power-off task is configured to be able to be canceled by a predetermined user (administrator) and the power-off task is canceled.

A power-off can thus be left undone even if the execution of a restart subsequent to device setting is canceled. In such cases, the result of execution of the device setting that is supposed to be applied to the device is left unapplied due to the absence of the restart.

In a second exemplary embodiment, the MFP 102 includes a function of notifying the administrator of an event occurring in the device (MFP 102). The MFP 102 is configured to make a notification to the administrator in the event that the device is left without a restart.

The second exemplary embodiment will be described below only in terms of differences from the first exemplary embodiment. Omitted details are similar to those of the first exemplary embodiment.

Network device management software according to the second exemplary embodiment will initially be described with reference to FIG. 20.

FIG. 20 is a block diagram illustrating an example of an internal configuration of the network device management software according to the second exemplary embodiment.

The units and modules **401** to **442** illustrated in FIG. **20** are similar to those illustrated in FIG. **4**. A description thereof is omitted.

A state notification unit **2001** makes a notification to the administrator when an event to be notified to the administrator occurs in the network device management system. For example, if restart processing of a device setting task is canceled due to the presence of a power-off task and then the power-off task is canceled, the state notification unit **2001** transmits the event to the information processing apparatus **103** of the administrator to notify the administrator of the cancellation of the power-off task. The state notification unit **2001** is configured to make the notification to a notification designation (such as an e-mail address) of the administrator by using a notification unit such as e-mail. The notification destination (such as an e-mail address) of the administrator is stored in a storage device such as the storage **203** of the MFP **102** in advance.

Next, a configuration for the administrator to cancel a power-off task will be described with reference to FIG. **17**.

FIG. **17** is a diagram schematically illustrating a power-off task cancel screen which the task control unit **413** displays on a web browser running on the information processing apparatus **103** via the network **101** by using a servlet and from which the administrator can cancel a power-off task.

In FIG. **17**, the power-off task cancel screen includes a confirm button **1701** for the cancellation of a power-off task and a quit button **1702** for the cancellation of a power-off task.

Receiving a request to cancel a power-off task from the information processing apparatus **103**, the task control unit **413** generates and transmits the power-off task cancel button (FIG. **17**) to the information processing apparatus **103**.

A web browser is running on the information processing apparatus **103**. The information processing apparatus **103** displays the power-off task cancel screen (FIG. **17**) on the web browser. When the administrator makes a pressing operation on the confirm button **1701** or the quit button **1702**, the information processing apparatus **103** transmits operation information to the task control unit **413**.

The task control unit **413** receives the operation information transmitted from the information processing apparatus **103**, and examines the operation information. If the operation information indicates a pressing operation on the confirm button **171**, the task control unit **413** cancels the power-off task. On the other hand, if the operation information indicates a pressing operation on the quit button **1702**, the task control unit **413** will not cancel the power-off task.

Next, power-off task processing [**2**] according to the second exemplary embodiment will be described with reference to FIG. **18**. As mentioned above, the rest of the task processing of the task control unit **413** is similar to that of the first exemplary embodiment. A description thereof is omitted.

FIG. **18** is a flowchart illustrating the power-off task processing [**2**] of the task control unit **413** according to the second exemplary embodiment. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM.

In step S**18001** of the power-off task processing [**2**] according to the second exemplary embodiment, the task control unit **413** initially performs a job wait. In this step, the task control unit **413** waits until the job wait maximum waiting time **503** of the task data on the power-off task currently in process has elapsed, until there becomes no remaining job in the meantime, or until the power-off task is canceled in the meantime. The lapse of the job wait maximum waiting time **503** refers to the lapse of the job wait maximum waiting time **503** since the start time **502** of the power-off task currently in process.

If there is determined to be no remaining job during the job wait in step S**18001** ("THERE IS NO REMAINING JOB" in step S**18001**), the task control unit **413** advances the processing to step S**18002**. The processing in step S**18002** is similar to that in step S**16302** in FIG. **16**D. A description thereof is omitted.

If the job wait maximum waiting time **503** is determined to have elapsed during the job wait in step S**18001** ("WAITING TIME HAS ELAPSED" in step S**18001**), the task control unit **413** advances the processing to step S**18003**.

In step S**18003**, the task control unit **413** check whether the forced off flag **504** is on. If the forced off flag **504** is determined to be on (YES in step S**18003**), the task control unit **413** determines that the power-off task is instructed to be forcibly executed, and advances the processing to step S**18002**.

On the other hand, if the forced off flag **504** is determined not to be on (NO in step S**18003**), the task control unit **413** determines that the power-off task is not instructed to be forcibly executed, and advances the processing to step S**18004**.

If the power-off task is determined to be canceled during the job wait in step S**18001** ("CANCELED" in step S**18001**), the task control unit **413** advances the processing to step S**18004**.

In step S**18004**, the task control unit **413** notifies the administrator via the state notification unit **2001** that the processing of the task has ended without a power-off. After the completion of the notification in step S**18004**, the task control unit **413** exits from the power-off task processing [**2**] and advances the processing to the next step according to the processing procedure of the calling source.

As has been described above, according to the second exemplary embodiment, proper processing can be performed even if a restart that accompanies device setting is initially canceled due to the presence of a power-off task and then the power-off task is canceled.

More specifically, if the forced off flag **504** is set so that the power-off task does not force a power-off, or if the administrator cancels the power-off task afterwards and the MFP **102** remains powered on, a notification is made to the administrator.

With such a configuration, the administrator can manually restart the device (MFP **102**) without delay, whereby the device setting is promptly and properly applied to the device and becomes usable.

The task control unit **413** may also be configured to make a notification to the administrator via the state notification unit **2001** in the following cases.

For example, the task control unit **413** may be configured, if the determination in step S**16105** of FIG. **16**B is NO, to notify the administrator that the power-off will not be executed.

The task control unit **413** may be configured, if the determination in step S**16201** of FIG. **16**C is "WAITING TIME HAS ELAPSED," to notify the user that the device setting will not be executed.

The task control unit **413** may be configured, if the setting processing pre-start job maximum waiting time **707** is determined to have elapsed during the pre-start wait in step S**16501** of FIG. **16**F, to notify the administrator that the device setting will not be executed.

The task control unit **413** may be configured, if device setting is executed, to notify the administrator of the execution.

The task control unit **413** may also be configured, if processing is not performed as set by the administrator like when device setting is not executed due to job execution, to notify the administrator of the failed execution.

The task control unit **413** may be configured to make a notification to the administrator immediately before a power-off is executed, or immediately before or immediately after a restart is executed.

With such a configuration, the administrator can immediately comprehend the state of the device (MFP **102**) and facilitate management and/or promptly take necessary measures.

In the foregoing second exemplary embodiment, the task control unit **413** is configured to make a notification to the administrator and thereby prompt the administrator to restart the device if a restart that accompanies device setting is initially canceled due to the presence of a power-off task and then the power off-task is canceled. In a third exemplary embodiment, the task control unit **413** is configured to automatically execute a restart in such a case.

The third exemplary embodiment will be described below only in terms of differences from the second exemplary embodiment. Omitted details are similar to those of the second exemplary embodiment.

Power-off task processing [**2**] according to the third exemplary embodiment will be described with reference to FIG. **19**. As mentioned above, the rest of the task processing of the task control unit **413** is similar to that of the first exemplary embodiment. A description thereof is omitted.

FIG. **19** is a flowchart illustrating the power-off task processing [**2**] of the task control unit **413** according to the third exemplary embodiment. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM. Similar steps to those of FIG. **18** are designated by the same step numbers. The following description deals only with differences from FIG. **18**.

If, in step S**18003**, the forced off flag **504** is determined not to be on (NO in step S**18003**), the task control unit **413** determines that the power-off task is not instructed to be forcibly executed. After the end of the processing of the waited job, the task control unit **413** advances the processing to step S**19004**.

If the power-off task is determined to be canceled during the job wait in step S**18001** ("CANCELED" in step S**18001**), the task control unit **413** also advances the processing to step S**19004**.

In step S**19004**, the task control unit **413** instructs the restart execution module **434** to restart. After the completion of the instruction, the task control unit **413** exits from the power-off task processing [**2**] and advances the processing to the next step according to the processing procedure of the calling source.

As described above, according to the third exemplary embodiment, proper processing can be performed even if a restart that accompanies device setting is initially canceled due to the presence of a power-off task and then the power-off task is canceled.

More specifically, if the forced off flag **504** is set so that the power-off task does not force a power-off, or if the administrator cancels the power-off task afterwards and the MFP **102** remains powered on, a proper restart is performed anew, whereby the device setting is properly applied and becomes usable.

In the foregoing second exemplary embodiment, the administrator needs to receive a notification and manually restart the device. One of the advantages of the third exemplary embodiment is that such an operation is not needed.

The third exemplary embodiment may include the state notification unit **2001** illustrated in FIG. **20**. Like the second exemplary embodiment, the task control unit **413** may be configured to make a notification to the administrator via the state notification unit **2001**.

For example, the task control unit **413** may be configured, if a restart is executed in step S**19004** of FIG. **19**, to notify the administrator of the execution of the restart.

The task control unit **413** may also be configured to make a notification to the administrator in various other cases described in the last paragraphs of the second exemplary embodiment.

With such a configuration, the administrator can immediately comprehend the state of the device (MFP **102**) and facilitate management and/or promptly take necessary measures.

In the foregoing first to third exemplary embodiments, the task control unit **413** is configured, if the final execution time Ts of a power-off task comes before the device setting processing completion expected final time Tcomp, to always execute a device setting task at next startup time. In such a case, the device setting task will be completed and the setting will be applied later than expected. A higher priority may be given to the execution of the device setting task. However, the final execution time Ts of the power-off task will elapse while the device setting execution module **433** is executing the device setting, which can make the power-off not possible to execute.

In view of the foregoing, in a fourth exemplary embodiment, the task control unit **413** is configured to maximize the possibility of execution of both a device setting task and a power-off task even if the final execution time Ts of the power-off task is set to come during the execution of the device setting execution module **433**.

The fourth exemplary embodiment will be described below only in terms of differences from the first to third exemplary embodiment. Omitted details are similar to those of the first to third exemplary embodiments.

Power-off task data according to the fourth exemplary embodiment will initially be described with reference to FIG. **22**.

FIG. **22** is a diagram schematically illustrating a data configuration of the power-off task data according to the fourth exemplary embodiment.

In FIG. **22**, the flags and times **501** to **504** are similar to those of FIG. **5**. A description thereof is omitted. The power-off task data also includes a job wait final time **2201**.

The job wait final time **2201** is calculated by the power-off task generation module **421**. In step S**1008** of FIG. **10**, the power-off task generation module **421**, while generating power-off task data, calculates the job wait final time **2201** by the following method. If the immediate flag **501** indicates that the power-off task is to be "executed according to a schedule," the power-off task generation module **421** calculates the job wait final time **2201** by adding the job wait maximum waiting time **503** to the start time **502**. If the immediate flag **501** indicates that the power-off task is to be "immediately executed," the power-off task generation module **421** calculates the job wait final time **2201** by adding the job wait maximum waiting time **503** to the current time.

Next, device setting task processing [**2**] according to the fourth exemplary embodiment will be described with reference to FIG. **21**A. Reboot processing [**1**] according to the fourth exemplary embodiment will be described with reference to FIG. **21**B. As mentioned above, the rest of the task processing of the task control unit **413** is similar to that of any of the first to third exemplary embodiments. A description thereof is omitted.

FIG. **21**A is a flowchart illustrating the device setting task processing [**2**] of the task control unit **413** according to the fourth exemplary embodiment. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM. Similar steps to those of FIG. **16**E are designated by the same step numbers. The following description deals only with differences from FIG. **16**E.

In step S**16401** of the device setting task processing [**2**] according to the fourth exemplary embodiment, the task control unit **413** compares the device setting processing completion expected final time Tcomp of the device setting task currently in process with the final execution time Ts of the power-off task at a near time. If the final execution time Ts of the power-off task is determined to come before the device setting processing completion expected final time Tcomp ("Ts COMES FIRST" in step S**16401**), the task control unit **413** advances the processing to step S**21401**.

In step S**21401**, the task control unit **413** compares the start time **502** of the power-off task with Tcomp.

If the start time **502** is determined to come after Tcomp ("Tcomp COMES FIRST" in step S**21401**), the task control unit **413** simply advances the processing to step S**16402**.

On the other hand, if the start time **502** is determined to come before Tcomp ("START TIME **502** COMES FIRST" in step S**21401**), the task control unit **413** advances the processing to step S**21402**. In step S**21402**, the task control unit **413** reschedules the power-off task. More specifically, the task control unit **413** generates and registers power-off task data in which the start time **502** is set to "88:88" which represents that the power-off task is to be executed immediately after the completion of device setting processing. The task control unit **413** then deletes the former power-off task data for rescheduling. After the completion of the rescheduling, the task control unit **413** advances the processing to step S**16402**.

In step S**16403**, the task control unit **413** completes the device setting, and advances the processing to step S**21403**.

In step S**21403**, the task control unit **413** check whether there is a power-off task designated for a start time "88:88." The task control unit **413** thereby determines whether there is a power-off task to be executed immediately after the completion of the device setting processing.

If there is no power-off task designated for the start time "88:88," the task control unit **413** determines that there is no power-off task to be executed immediately after the completion of the device setting processing (NO in step S**21403**). The task control unit **413** advances the processing to step S**16404**.

On the other hand, if there is a power-off task designated for the start time "88:88," the task control unit **413** determines that there is a power-off task to be executed immediately after the completion of the device setting processing (YES in step S**21403**). The task control unit **413** advances the processing to step S**21404**.

In step S**21404**, the task control unit **413** recalculates waiting time. If the current time has passed the final execution time Ts (i.e., the job wait final time **2201**) of the original power-off task, the task control unit **413** sets the current time into the start time **502** and "0" into the job wait maximum waiting time **503** to make the waiting time zero. On the other hand, if the current time has not yet passed the final execution time Ts (job wait final time **2201**) of the original power-off task, the task control unit **413** sets the current time into the start time **502** and a difference between Ts and the current time into the job wait maximum waiting time **503**, thereby setting the waiting time to the difference between Ts and the current time. After the completion of the recalculation of the waiting time, the task control unit **413** advances the processing to step S**16409**. Other steps are similar to those of FIG. **16**E. A description thereof is omitted.

FIG. **21**B is a flowchart illustrating the reboot processing [**1**] of the task control unit **413** according to the fourth exemplary embodiment. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM. Similar steps to those of FIG. **16**G are designated by the same step numbers. The following description deals only with differences from FIG. **16**G.

In the step S**21601** of the reboot processing [**1**] according to the fourth exemplary embodiment, the task control unit **413** initially checks whether there is a new power-off task.

If there is determined to be a new power-off task (YES in step S**21601**), the task control unit **413** advances the processing to step S**21602**.

In step S**21602**, the task control unit **413** compares the current time with the final execution time Ts of the power-off task.

If the current time is determined not to have passed Ts yet ("NOT PAST Ts" in step S**21602**), the task control unit **413** advances the processing to step S**16602**.

On the other hand, if the current time is determined to have already passed Ts ("ALREADY PAST Ts" in step S**21602**), the task control unit **413** advances the processing to step S**16606**.

As has been described above, there are cases where the final execution time Ts of a power-off task comes between the start of device setting processing of a device setting task and the device setting processing completion expected final time Tcomp. In such cases, according to the foregoing first to third exemplary embodiments, the entire device setting task is canceled and will be executed at next startup time. This can cause a considerable delay of the time when the device setting task is eventually executed. According to the fourth exemplary embodiment, even in such cases, the device setting based on the device setting task can be executed at an initially intended time where possible, along with a power-off.

The reboot processing [**1**] includes two separate steps "pre-restart wait" and "instruct to restart." According to the first to third exemplary embodiments, the task control unit **413** initially enters a "pre-restart wait" before checking for the presence of a new power-off task. According to the fourth exemplary embodiment, the task control unit **413** is configured, if there is a new power-off task that is issued during the "device setting processing" immediately before the reboot processing [**1**] and reaches the final execution time Ts, to process the power-off task by priority.

As has been described above, according to the first and third exemplary embodiments, if the device setting processing completion expected final time Tcomp of a device setting task comes after the final execution time Ts of a power-off task, the "device setting processing" is always executed after a restart. This can increase the possibility that the device setting takes effect later than expected by the administrator. According to the fourth exemplary embodiment, the task control unit **413** is configured to reschedule a power-off task so that the power-off task will be executed immediately after the setting process of a device setting task, and execute the setting process of the device setting task even if the end (Ts) of the designated period of the power-off task falls within a period between the beginning of the designated period of the device setting task and the date and time (Tcomp) when the setting process is estimated to be completed, provided that the beginning (start time **502**) of the designated period of the power-off task comes before the date and time (Tcomp) when the setting process of the device setting task is estimated to be completed. This creates a situation where the device setting processing can be executed even in the foregoing case. As compared to the first to third exemplary embodiments, the device setting processing can be executed more often. Consequently, as compared to the first to third exemplary embodiments, device setting can be performed at a time expected by the administrator more often.

In an actual system, an external power supply may be disconnected while device setting based on a device setting task is in operation. In such a case, the administrator can generate a power-off task in consideration of the time when the power supply may be disconnected. However, the administrator may sometimes be unaware that a device setting task would start device setting processing at the same time.

A fifth exemplary embodiment deals with a configuration that can avoid such a situation by imposing limitations on the generation of a power-off task in the foregoing case.

The fifth exemplary embodiment will be described below with reference to the drawings. The following description deals only with differences from the first to fourth exemplary embodiments. Omitted details are similar to those of any of the first to fourth exemplary embodiments.

Power-off task generation processing according to the fifth exemplary embodiment will initially be described with reference to the flowchart of FIG. **24**.

FIG. **24** is a flowchart illustrating an example of a procedure by which the power-off task generation module **421** according to the fifth exemplary embodiment generates a power-off task. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM. Similar steps to those of FIG. **10** are designated by the same step numbers. The following description deals only with differences from FIG. **10**.

The power-off task generation module **421** initially receives a request to generate a power-off task from the information processing apparatus **103**. In step S**2401**, the power-off task generation module **421** starts the processing.

In step S**2402**, the power-off task generation module **421** determines whether there is device setting task data.

If there is determined to be no device setting task data (NO in step S**2402**), the power-off task generation module **421** advances the processing to step S**1002**.

If there is determined to be device setting task data (YES in step S**2402**), the power-off task generation module **421** advances the processing to step S**2403**.

In step S**2403**, the power-off task generation module **421** calculates a constraint condition on a power-off task. More specifically, the power-off task generation module **421** calculates a constraint condition that inhibits the generation of a power-off task whose final execution time Ts reaches or exceeds the device setting processing completion expected final time Tcomp. The power-off task generation module **421** then advances the processing to step S**1002**.

In step S**2404**, the power-off task generation module **421** performs data consistency check processing. Here, the power-off task generation module **421** verifies data consistency as in step S**1004** of FIG. **10**. The power-off task generation module **421** also determines data to be inconsistent if the data is operable to generate a power-off task that interferes with the foregoing constraint condition. The rest of the processing is similar to that illustrated in FIG. **10**. A description thereof is omitted.

A power-off task generation screen according to the fifth exemplary embodiment will be described below with reference to FIG. **25**.

FIG. **25** is a diagram schematically illustrating the power-off task generation screen which the power-off task generation module **421** according to the fifth exemplary embodiment displays on a web browser running on the information processing apparatus **103** via the network **101** by using a servlet and from which the administrator can generate a power-off task. Similar items to those of FIG. **6** are designated by the same reference numerals. The following description deals only with differences from FIG. **6**.

In FIG. **25**, the power-off task generation screen includes a message **2501** to be presented to the administrator about the foregoing constraint condition. The message **2501** will not be displayed if there is no device setting task. Without a device setting task, the power-off task generation screen is the same as that illustrated in FIG. **6**.

Next, a configuration for the administrator to cancel a device setting task will be described with reference to FIG. **23**.

FIG. **23** is a diagram schematically illustrating a device setting task cancel screen which the task control unit **413** displays on a web browser running on the information processing apparatus **103** via the network **101** by using a servlet and from which the administrator can cancel a device setting task.

In FIG. **23**, the device setting task cancel screen includes a confirm button **2301** for the cancellation of a device setting task, and a quit button **2302** for the cancellation of the device setting task.

Receiving a request to cancel a device setting task from the information processing apparatus **103**, the task control unit **413** generates and transmits the device setting task cancel screen (FIG. **23**) to the information processing apparatus **103**.

A web browser is running on the information processing apparatus **103**. The information processing apparatus **103** displays the device setting task cancel screen (FIG. **23**) on the web browser. When the administrator makes a pressing operation on the confirm button **2301** or the quit button **2302**, the information processing apparatus **103** transmits operation information to the task control unit **413**.

The task control unit **413** receives the operation information transmitted from the information processing apparatus **103**, and examines the operation information. If the operation information indicates a pressing operation on the confirm button **2301**, the task control unit **413** cancels the device setting task. On the other hand, if the operation information indicates a pressing operation on the quit button **2302**, the task control unit **413** will not cancel the device setting task.

Next, device setting task processing [**1**] according to the fifth exemplary embodiment will be described with reference to FIG. **26**A. Device setting task processing [**3**] according to the fifth exemplary embodiment will be described with reference to FIG. **26**B. The rest of the task processing of the task control unit **413** is similar to that of any of the first to fourth exemplary embodiments. A description thereof is omitted.

FIG. **26**A is a flowchart illustrating the device setting task processing [**1**] of the task control unit **413** according to the fifth exemplary embodiment. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM. Similar steps to those of FIG. **16**C are designated by the same stem numbers. The following description deals only with differences from FIG. **16**C.

In step S**26201** of the device setting task processing [**1**] according to the fifth exemplary embodiment, the task control unit **413** initially performs a pre-start wait. In this step, the task control unit **413** waits until time has elapsed as much as the setting processing pre-start job wait maximum waiting time **707** of the device setting task currently in process, until there becomes no remaining job in the meantime, until a new power-off task is issued in the meantime, or until the device setting task is canceled in the meantime.

If a new power-off task is determined to be issued during the pre-start wait in step S**26201** ("THERE IS NEW POWER-OFF TASK" in step S**26201**), the task control unit **413** advances the processing to step S**16202**. The processing in steps S**16202** to S**16205** is similar to that in FIG. **16**C. A description thereof is omitted.

If there is determined to be no remaining job during the pre-start wait in step S**26201** ("THERE IS NO REMAINING JOB" in step S**26201**), the task control unit **413** advances the processing to step S**16206**. The processing in steps S**16206** and S**16207** is similar to that in FIG. **16**C. A description thereof is omitted.

If the setting processing pre-start job wait maximum waiting time **707** is determined to have elapsed during the pre-start wait in step S**26201** ("WAITING TIME HAS ELAPSED" in step S**26201**), the task control unit **413** simply exits from the device setting task processing [**1**] and advances the processing to the next step according to the processing procedure of the calling source.

If the device setting task is determined to be canceled during the pre-start wait in step S**26201** ("DEVICE SETTING TASK IS CANCELED" in step S**26201**), the task control unit **413** simply exits from the device setting task processing [**1**] and advances the processing to the next step according to the processing procedure of the calling source.

FIG. **26**B is a flowchart illustrating the device setting task processing [**3**] of the task control unit **413** according to the fifth exemplary embodiment. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM. Similar steps to those of FIG. **16**F are designated by the same step numbers. The following description deals only with differences from FIG. **16**F.

In step S**26501** in the device setting task processing [**3**] according to the fifth exemplary embodiment, the task control unit **413** initially performs a pre-start wait. In this step, the task control unit **413** waits until the setting processing pre-start job wait maximum waiting time **707** of the device setting task in process has elapsed, until there becomes no remaining job in the meantime, or until the device setting task is canceled in the meantime.

If there is determined to be no remaining job during the pre-start wait in step S**26501** ("THERE IS NO REMAINING JOB" in step S**26501**), the task control unit **413** advances the processing to step S**16502**. The processing in steps S**16502** to S**16506** is similar to that in FIG. **16**F. A description thereof is omitted.

If the setting processing pre-start job wait maximum waiting time **707** is determined to have elapsed during the pre-start wait in step S**26501** ("WAITING TIME HAS ELAPSED" in step S**26501**), the task control unit **413** advances the processing to step S**16507**.

If the device setting task is determined to be canceled during the pre-start wait in step S**26501** ("DEVICE SETTING TASK IS CANCELED" in step S**26501**), the task control unit **413** advances the processing to step S**16507**.

The processing in step S**16507** is similar to that in FIG. **16**F. A description thereof is omitted.

As has been described above, according to the fifth exemplary embodiment, if a device setting task already exists, the administrator is not allowed to generate a power-off task that may cause a power-off while the device setting value acquisition module **432** or the device setting execution module **433** is acquiring a device setting value or executing setting. More specifically, the power-off task providing unit **414** inhibits designation of a power-off task such that the end of the designated period of the power-off task to be designated is included in a period between the beginning of the designated period of the designated device setting task and a date and time when the setting process is estimated to be completed. This can inform the administrator of the danger that a power-off may be scheduled for a period when the acquisition of a device setting value and the execution of device setting are in process.

In the foregoing fifth exemplary embodiment, the administrator can freely set a device setting task. If a power-off task is already set, the administrator can thus set a device setting task that may conflict with the power-off task.

A sixth exemplary embodiment provides a configuration that imposes a constraint condition so that if there is a power-off task, a device setting task that may conflict with the power-off task is not able to be generated.

The sixth exemplary embodiment will be described below only in terms of differences from the fifth exemplary embodiment. Omitted details are similar to those of the fifth exemplary embodiment.

Device setting task generation processing according to the sixth exemplary embodiment will initially be described with reference to the flowchart of FIG. **28**.

FIG. **28** is a flowchart illustrating an example of a procedure by which the device setting task generation module **431** according to the sixth exemplary embodiment generates a device setting task. The processing of this flowchart is implemented by the CPU inside the controller **202** executing a program stored in the internal ROM. Similar steps to those of FIG. **13** are designated by the same step numbers. The following description deals only with differences from FIG. **13**.

The device setting task generation module **431** according to the sixth exemplary embodiment initially receives a request to generate a device setting task from the information processing apparatus **103**. In step S**2801**, the device setting task generation module **431** starts the processing.

In step S**2802**, the device setting task generation module **431** checks whether there is power-off task data.

If there is determined to be power-off task data (YES in step S**2802**), the device setting task generation module **431** advances the processing to step S**2803**.

In step S**2803**, the device setting task generation module **431** calculates a constraint condition on a device setting task. The device setting task generation module **431** calculates the constraint condition so that an execution time and waiting time cannot be set to call the device setting value acquisition module **432** or the device setting execution module **433** in a time range where a power-off may occur, i.e., between the start time **502** and the final execution time Ts of the power-off task. The device setting task generation module **431** then advances the processing to step S**1302**.

If, in step S**2802**, there is determined to be no power-off task data (NO in step S**2802**), the device setting task generation module **431** advances the processing to step S**1302**.

In step S**2804**, the device setting task generation module **431** performs data consistency check processing. Here, the device setting task generation module **431** verifies data consistency like step S**1307** of FIG. **10**. The device setting task generation module **431** also determines data to be inconsistent if the data is operable to generate a device setting task that interferes with the foregoing constraint condition. The rest of the processing is similar to that illustrated in FIG. **13**. A description thereof is omitted.

Next, a device setting task generation screen according to the sixth exemplary embodiment will be described with reference to FIG. **27**.

FIG. **27** is a diagram schematically illustrating the device setting task generation screen, which the device setting task generation module **431** according to the sixth exemplary embodiment displays on a web browser running on the information processing apparatus **103** via the network **101** by using a servlet and from which the administrator can generate a device setting task. Similar items to those of FIG. **8** are designate by the same reference numerals. The follow description deals only with differences from FIG. **8**.

In FIG. **27**, the device setting task generation screen includes a message **2701** to be presented to the administrator about the foregoing constraint condition. The message **2701** will not be displayed if there is no power-off task. Without a power-off task, the device setting task generation screen is the same as that illustrated in FIG. **8**.

As has been described above, according to the sixth exemplary embodiment, if a power-off task already exists, the administrator is not allowed to generate a device setting task that may acquire a device setting value or execute setting at a time when a power-off may be executed. More specifically, the device setting task providing unit **415** inhibits designation of a device setting task such that the end of the designated period of the designated power-off task is not included in a period between the beginning of the designated period the device setting task to be designated and a date and time when the setting process is estimated to be completed. This can inform the administrator of the danger that the acquisition of a device setting value or the execution of device setting may be scheduled for a period when a power-off is in process.

As has been described above, according to the exemplary embodiments of the present invention, device setting and a power-off can be properly performed even if the device setting, an accompanying restart, and the power-off are instructed to be executed immediately or according to a schedule in an overlapping manner.

In particular, a power-off is prevented from being left undone at a time when the power-off is supposed to have surely been performed. This can prevent a failure of the device (the MFP **102**) from occurring even if the power supply is disconnected from outside.

The configurations and contents of the various types of data are not limited to the foregoing. Various configurations and contents may be included depending on applications and purposes.

While the exemplary embodiments have been described above, an exemplary embodiment of the present invention may be practiced, for example, as a system, apparatus, method, program, and/or storage medium. Specifically, an exemplary embodiment of the present invention can be applied to a system including a plurality of devices, or can be applied to an apparatus including a single device.

Configurations including combinations of the foregoing exemplary embodiments are all intended to be embraced in exemplary embodiments of the present invention.

Aspects of the present invention can also be realized by a computer of a system or apparatus (or devices such as a CPU or MPU) that reads out and executes a program recorded on a memory device to perform the functions of the above-described embodiment(s), and by a method, the steps of which are performed by a computer of a system or apparatus by, for example, reading out and executing a program recorded on a memory device to perform the functions of the above-described embodiment(s). For this purpose, the program is provided to the computer for example via a network or from a recording medium of various types serving as the memory device (e.g., computer-readable medium).

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all modifications, equivalent structures, and functions.

This application claims priority from Japanese Patent Application No. 2012-031392 filed Feb. 16, 2012, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. An image forming apparatus comprising:

a first designation unit configured to designate a power-off task of shutting down the image forming apparatus in a designated period;

a second designation unit configured to designate a setting task of executing a setting process for setting a setting item of the image forming apparatus in a designated period and a restart process for restarting the image forming apparatus after the setting process; and

a task control unit configured to control execution of the designated power-off task and the designated setting task,

wherein the task control unit is configured to, if the power-off task is designated, perform control to change processing of the power-off task and the setting task according to whether an end of the designated period of the power-off task reaches a period corresponding to the setting process of the setting task or a period corresponding to the restart process of the setting task, and

wherein the task control unit is configured to, if the end of the designated period of the power-off task is included in a period between a date and time when the setting process of the setting task is estimated to be completed and a date and time when the image forming apparatus is estimated to be completely restarted by the restart process of the setting task, perform control to execute the setting process of the setting task, cancel the restart process of the setting task, and execute the power-off task.

2. The image forming apparatus according to claim **1**, wherein the task control unit is configured to, if the end of the designated period of the power-off task is included in a period between a beginning of the designated period of the setting task and a date and time when the setting process is estimated to be completed, perform control to once cancel the setting task, reschedule the setting task so that the setting task is to be executed at next startup time of the image forming apparatus, and execute the power-off task.

3. The image forming apparatus according to claim **2**, wherein the task control unit is configured to, if the end of the designated period of the power-off task is included in the period between the beginning of the designated period of the setting task and the date and time when the setting process is estimated to be completed and a beginning of the designated period of the power-off task comes before the date and time when the setting process of the setting task is estimated to be completed, perform control to reschedule the power-off task so that the power-off task is to be executed immediately after the setting process of the setting task, and execute the setting process of the setting task.

4. The image forming apparatus according to claim **1**, wherein the task control unit is configured to, if the end of the designated period of the power-off task comes after a date and time when the image forming apparatus is estimated to be completely restarted by the restart process of the setting task, perform control to execute the setting process of the setting task, once cancel the power-off task, reschedule the power-off task so that the power-off task is to be executed at next startup time of the image forming apparatus, and execute the restart process of the setting task.

5. The image forming apparatus according to claim **1**, further comprising a notification unit configured to make a notification to a predetermined user in a case where the power-off task is not executed even though the restart process of the setting task is canceled by the task control unit.

6. The image forming apparatus according to claim **5**, wherein the notification is to prompt the predetermined user to manually restart the image forming apparatus.

7. The image forming apparatus according to claim **5**, further comprising a cancel unit configured to cancel the power-off task according to an instruction from the predetermined user,

wherein the case where the power-off task is not executed includes a case where the power-off task is canceled by the cancel unit.

8. The image forming apparatus according to claim **5**, wherein the first designation unit is configured to make designation including presence or absence of a forced execution instruction to execute the power-off task even if execution of a waited job does not end within the designated period, and

wherein the case where the power-off task is not executed includes a case where the forced execution instruction is not given for the power-off task and the execution of a waited job does not end within the designated period of the power-off task.

9. The image forming apparatus according to claim **1**, wherein the task control unit is configured to restart the image forming apparatus in a case where the power-off task is not executed even though the restart process of the setting task is canceled.

10. The image forming apparatus according to claim **1**, wherein the first designation unit is configured to inhibit designation of the power-off task such that the end of the designated period of the power-off task to be designated is included in a period between a beginning of the designated setting task and a date and time when the setting process is estimated to be completed.

11. The image forming apparatus according to claim **1**, wherein the second designation unit is configured to inhibit designation of the setting task such that the end of the designated period of the designated power-off task is not included in a period between a beginning of the designated period of the setting task to be designated and a date and time when the setting process is estimated to be completed.

12. A method for controlling an image forming apparatus, the method comprising:

designating a power-off task of shutting down the image forming apparatus in a designated period;

designating a setting task of executing a setting process for setting a setting item of the image forming apparatus in a designated period and a restart process for restarting the image forming apparatus after the setting process;

controlling execution of the designated power-off task and the designated setting task; and

performing, if the power-off task is designated, control to change processing of the power-off task and the setting task according to whether an end of the designated period of the power-off task reaches a period corresponding to the setting process of the setting task or a period corresponding to the restart process of the setting task, and

wherein, if the end of the designated period of the power-off task is included in a period between a date and time when the setting process of the setting task is estimated to be completed and a date and time when the image forming apparatus is estimated to be completely restarted by the restart process of the setting task, performing control to execute the setting process of the setting task, cancel the restart process of the setting task, and execute the power-off task.

13. A non-transitory computer-readable storage medium storing a computer program that causes a computer to execute a method for controlling an image forming apparatus, the method comprising:

designating a power-off task of shutting down the image forming apparatus in a designated period;

designating a setting task of executing a setting process for setting a setting item of the image forming apparatus in a designated period and a restart process for restarting the image forming apparatus after the setting process;

controlling execution of the designated power-off task and the designated setting task; and

performing, if the power-off task is designated, control to change processing of the power-off task and the setting task according to whether an end of the designated period of the power-off task reaches a period corresponding to the setting process of the setting task or a period corresponding to the restart process of the setting task, and

wherein, if the end of the designated period of the power-off task is included in a period between a date and time when the setting process of the setting task is estimated to be completed and a date and time when the image forming apparatus is estimated to be completely restarted by the restart process of the setting task, performing control to execute the setting process of the setting task, cancel the restart process of the setting task, and execute the power-off task.

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